THE TREATMENT OF TUBERCULOSIS

by means of

SPENGLER'S IMMUNE BODIES.

(IK Therapy).

Thesis presented for the degree of M.D. 1916
of Edinburgh University.

Written

by

Adam Niven Robertson,

M.B., Ch.B., (Edin. Univ.),

D.P.H., (Camb.).

SUMMARY OF CONTENTS.

1. Nature of these Immune Bodies:-
    a. Agglutinins
    b. Praecipitins
    c. Lysins.
    d. Antitoxins.
2. Testing of I K for these Immune Bodies.

VII. The preparation of IK for treatment and its detailed description.

VIII. Physical properties and reactions of IK.

IX. Dilution of IK for clinical use.

X. Method of use of IK in practice.

A. Clinical data of patient required before administration of IK.

B. Indications and contra-indications to clinical use of IK.

C. Method of administration of IK:-
    a. Subcutaneous.
    b. Percutaneous or Inunction.
    c. Oral.

D. Dosage:-
    a. Gradual method.
    b. Rapid method.
    c. Inunction method.
    d. Awtokratoff's method.
    e. Lukin's method.
    f. Commencing doses of various authors.

E. IK as a diagnostic agent.

F. IK as a prophylactic agent.

XI. Combination of IK with other treatments.

XII. Effect of IK.

a. Local reaction.

b. General reaction.

c. Focal reaction.

XIII. Clinical effects of IK.

XIV. Methods of control of effects of IK:-

a. Clinical results:- weight, pulse, temperature, sputum, physical signs, subjective symptoms, etc. etc.

b. Special precipitation tests of blood.

c. Arneth count.

d. Blood pressure.

e. Red Blood Cell Count.

f. Comparative agglutination and opsonic test of focal serum and general serum.

XV. Results obtained with IK treatment compared with the results obtained by other methods of treatment.

XVI. Summarised account of 41 cases of Tuberculosis treated by the author with IK.

XVII. Summary of clinical effects and results of IK treatment in those cases and conclusions deduced therefrom.

Bibliography.

THE TREATMENT OF TUBERCULOSIS
by means of
SPENGLER'S IMMUNE BODIES.
(I.K. Therapy).

1. PRELIMINARY:-

In the treatment of Pulmonary Tuberculosis by specific remedies or Tuberculins one was disappointed by the narrowed sphere of their usefulness. In very many cases Tuberculin owing to the important contraindications which forbid its use has to be set aside as probably more likely to do harm than good. These contraindications are most frequently found in the advanced cases. One cannot use Tuberculin where the patient shows the signs and symptoms of mixed infection, i.e. in cases where the fever is hectic in type with a marked daily range, low in the morning, high in the evening. The secondary organisms in such cases are often Streptococci. Usually there are also much emaciation and marked toxaemia which are both contraindications to the use of Tuberculin. Other symptoms prohibiting the use of Tuberculin are given, e.g. (1) large areas of consolidation which are said to tend to soften with the use of Tuberculin as the result of the focal reactions.

Some/

Some observers do not consider this a contraindication as they state the fibrosis is increased by the use of Tuberculin. (2) Multiple lesions because the dosage cannot be suited to the degree of severity of each lesion[1]. (3) Frequent haemoptyses. Wilkinson and others regard this as no barrier to the use of Tuberculin even in large doses[2].

It is necessary therefore in the use of Tuberculin that the patient should have some power of resistance and where this is absent Tuberculin will do more harm than good. This depends on the fact that all Tuberculins are of the nature of toxins and where the patient himself can produce no active immunising response to the stimulus of the toxin owing to excessive toxaemia the injection of more toxin will simply cause an overloading of toxin with evil result. Tuberculin treatment is analagous to treatment with vaccines and is the reverse of prophylactic treatment with immune or passive sera. It depends on an active immunity and not a passive immunity. Landmann considers the more toxic a Tuberculin is the greater will be the amount of antitoxin which will be formed. For this reason he introduced his toxic Tuberculols[3]. Most clinicians consider such treatment which depends on an active immunity dangerous in advanced cases.

Spengler introduced his IK treatment and considered it could be used in cases where the resistance of/

of the patient was very low as it depends in principle on passive methods of immunisation as well as active immunity. For this reason he contended it could be used in cases where Tuberculin was not allowable, in even the most advanced cases, with success. With a similar hope therefore I used IK in cases where I was sure Tuberculin would be harmful. With such advanced hopeless types of cases one was glad to think there was still some possibility of successful treatment by specific means. One was further buoyed up by the hope that the mixed infection which is often the cause of the advanced hopeless condition of these cases could be successfully combated by a substance such as IK which was polyvalent. That others had the same hopes is shown by the words of Professor Ruppell. He expressed his opinion of the future of IK treatment in somewhat poetic terms - "So do we see from the snow-covered regions of Davos the morning light of a new epoch in the struggle against Tuberculosis stream out red, and it is only to be hoped for the welfare of suffering humanity that this desirable land of wonder which opens out to our eager view has no dark ending".

II. DEFINITION OF I.K.:-

It is necessary at this point to briefly describe what I.K. is. The initials I.K. are the short for Immun-Körper or Immune Bodies.

IK/

IK is the acid Immune Blood of rabbits immunised against the Tubercle Bacillus of Koch, the Humano-Longus Tubercle Bacillus of Spengler and pyogenic organisms such as Streptococci.

III. DISTINCTIVE CHARACTERS OF TUBERCLE BACILLI, 3 TYPES, SHOWING THE BACILLI AGAINST WHICH I.K. IS EFFECTIVE:-

a. Morphology.

b. Cultural characters.

c. Ultramicroscopic characters.

d. Results of injections into man.

e. Animal experiments.

f. Sero-diagnostic results.

Spengler divides Tubercle bacilli into three types:-

1. The Tubercle Bacillus of Koch (Koch's Brevis).
2. The Humano-Longus Tubercle Bacillus (Spengler).

(Both of these are human types).

3. The Perlsucht Bacillus of cattle, Bovine Bacillus.

Spengler considers human lung Tuberculosis is a dual infection and due to the presence of the first two forms of bacilli in the large majority of cases.

The following contractions are used in this connection.

TB bacilli = Tubercle bacilli.

HL = Humanolongus bacillus

PB = Perlsucht bacillus.

He distinguishes these three types of bacilli by the several/

several methods following:-

a. Morphology.

b. Cultural characters.

c. Ultramicroscopic characters.

d. Results of injections into man.

e. Animal experiments.

f. Sero-diagnostic results.

a. Morphology and microscopic examination.

In 46 sputa examined by Spengler 45 showed presence of both Koch's Brevis and Humano-Longus. Only one case showed Koch's Brevis alone.

In another series of 112 cases of Phthisis whose sputa were examined he divided them into 3 groups.
1. Group. 78 cases - 60.8% showed both T.B. (Koch's Brevis) and P.B. in symbiosis. By P.B. in this article Spengler means the Humano-Longus bacillus (Vide Die Doppelätiologie der tuberkulösen Phthisie und die Vakzinationsbehandlung. Spengler's Tuberkulose und Syphilis arbeiten, p. 374 foot-note. See also Wiener Klinische Rundschau Nr.33. 1906)
2. Group. 22 cases - 19.8% only T.B. (Koch's Brevis).
3. Group. 6 cases - 5.3% only P.B.
4. Group. 16 cases - 14.3% only splitter bodies present. (8 cases had both T.B. (Koch's Brevis) and P.B. splitter, 7 cases only T.B. splitter, 1 case only P.B. splitter). Schroeder found in 100 sputa P.B. present only 11 times. (Beiträge zur Klinik der Tuberkulose./

Tuberkulose. Bd. XI. Hft 2).

Spengler considers the ordinary Ziehl-Nielsen method of staining the Tubercle Bacillus is inadequate for the proper differentiation of the three types of Tubercle Bacilli. For this purpose he has three special methods of staining.

a. Hüllen or capsule method.

1. Alkalise the film with a quite small amount of ($\frac{1}{2}$-1%) Na O H and dry with very gentle warming so as not to destroy the wax capsule of the Perlsucht which has a low melting point.

2. Flood the preparation with Loeffler's Methylene blue. Afterwards wash with water.

3. Stain with Carbol-Fuchsin with slight warming over the flame till vapour rises. Wash with water. Rapid heating is to be avoided. Fuchsin must not be boiled.

3. Stain in Methylene Blue with slow addition of 1-2 drops of 15% H N O_3 to the Methylene Blue (few seconds). Wash with water. Dry between filter paper, sparingly in the flame. The P.B. bacillus can then be quite readily distinguished by its larger size than the Koch's bacillus; also by the larger size of its splitter bodies.

2. Pikrin method. Use slightly thick preparation.

a. Carbol-Fuchsin stain with warming as above. Wash off the Fuchsin.

b. Stain with Picric Acid Alcohol - (equal parts of Esbach's Reagent and Absolute Alcohol). This acts/

acts as a mordaunt.

c. Wash with 60% Alcohol.

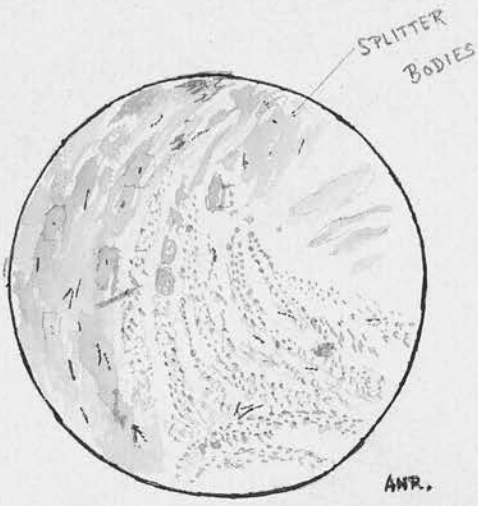
d. Flood with 15% HNO_3 till colour faintly yellow.

e. Wash with 60% Alcohol.

f. Contrast stain with Picric Acid Alcohol till colour faintly yellow, wash with H_2O, dry.

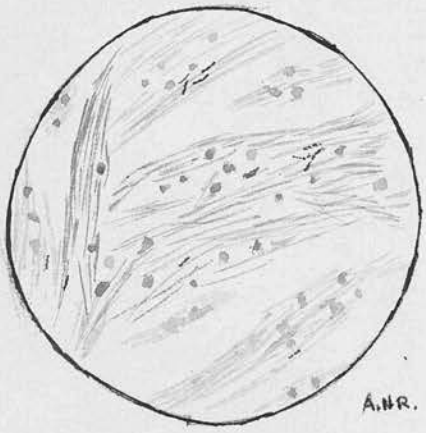
Spengler considers this the best method for differential staining. By this method also isolated splitter bodies can be accurately stained. In this way also in a given sputum a larger number of bacilli will stain than when done by the Ziehl-Nielsen method. From my own personal experience of this method I have found this to be the case and also that splitter bodies are well shown. Before using the oil immersion in staining with Pikrin method it is necessary often to find with the $\frac{1}{6}$ power the yellow-stained islands of elastic tissue in which the T.B. are to be found as in thin specimens these are sometimes difficult to find with $\frac{1}{12}$ power. The bacilli stain a bright rose red, while the background is faint yellow. The red is specific to acid-fast matter. Occasionally however the nuclei of cells retain the red stain. Spengler has shown that it stains even damaged bacilli well, as he has been able to stain T.B. bacilli previously shaken up with ether alcohol. It is of some value in prognosis because where the splitter in a specimen of sputum are numerous it usually

indicates/



24
TUBERCLE
BACILLI
PER FIELD

SPENGLER'S PICRIC ACID STAINING.



12.
TUBERCLE.
BACILLI
PER FIELD.

ZIEHL-NEELSEN STAINING METHOD.

THE ABOVE PAINTINGS REPRESENT FIELDS OF TWO SLIDES IN WHICH THE SAME DROPLET OF THE SAME SPUTUM WAS STAINED BY SPENGLER'S METHOD AND ZIEHL-NEELSEN METHOD.
MORE BACILLI ARE SHOWN UP BY THE FORMER METHOD.

indicates a tendency to degeneration of the bacilli or that the soil is unfavourable. In such a case there is usually a tendency to improvement. Kirchenstein[4] regarded the Spengler's Picric acid method better as a staining method than the various development and destruction methods. It shows splitter bodies better than Ziehl. He came to his conclusions as the result of a 100 sputa stained both by Picric acid method and the Ziehl-Neelsen method for purposes of comparison. Wirth found that the splitter bodies show better in Spengler's method. Lichtenhahn came to the same conclusion. Landolt found 4 times as many bacilli stained by the Picric acid method as by Ziehl. Kurthi got the same result. Adam and Bohm put the two methods equal. According to Spengler where the H.L. bacilli preponderate in a stained specimen of sputum over the Koch's Brevis the prognosis is better and vice versa[5].

3. Farbecht method.

This method depends on the fact that acid-fast bacteria when once they have absorbed the Fuchsin stain will not stain with the secondary stain or Methylene blue. Other organisms will. The use of the acid for decolourisation is therefore unnecessary.

a. Stain with Carbol-Fuchsin slightly warmed. Wash with 60% alcohol and afterwards stain with Methylene blue.

By/

By all these methods the Koch's Brevis and H.L. are easily differentiated, the former being much shorter and the granules much smaller. The capsule of Brevis is much thinner. The H.L. is seen to resemble the Perlsucht bacillus, but the latter is even longer and larger.

Microscopic and morphological characters of H.L.:-

It is acid-fast, alcohol-fast. Average size 3-3½ μ or over it. Thicker than Koch's. It forms genuine threads and splitter bodies (spores). It stains well with Gabbet. The spores are generally developed most at the ends. In rare cases a central spore appears. In fully mature forms one sometimes gets 6 spores and like anthrax, Spengler's views are here decidedly heterodox. The Tubercle Bacillus described in text-books[6] are 3-5 μ. According to Spengler the Humano-Longus type is this length. The Perlsucht Bacilli have less club-shaped ends and the threads are more frequent.

b. Cultural characteristics:-

Koch's Brevis for optimal growth requires much oxygen in atmosphere, less in medium.

Perlsucht bacillus for optimal growth requires much oxygen in medium, less in atmosphere.

H.L. bacillus requires a strongly alkaline medium.

Medium recommended by Spengler for H.L. is:-

Somatose./

(Somatose.
)
(Witte's Peptone.
) aa 5 gr.
(Na CL

Glycerine 30-40 cc.

Crystal Soda $2\frac{1}{4}$-$2\frac{1}{2}$ gr.

Aqua 1000 cc.

Agar 15 gr.

Spengler regards meat extract an unsatisfactory medium.

The culture shows the following appearances:- In 2-6 weeks appear non-transparent colonies about the size of streptococcal colonies. The best cultures are got by inoculation. Then they form a nodular, wrinkled, thick, grey skin. Pigment formation is absent. Spengler does not explain the brown pigment in the usual growth of the Tubercle Bacillus on 5% glycerine agar which being over 3 μ long he says must be Humano-Longus nor can I find any description by him of the culture of Koch's Brevis.

c. Ultramicroscopic examinations:-

(Der Bacterien-und-Infectionsdualismus der Tuberkulose im Ultramikroskop. Spengler's Tuberkulose und Syphilis arbeiten).

Here Spengler is much more explicit in the distinction between the three forms of Tubercle Bacillus, Koch's Brevis, Spengler's Humano-Longus, and true/

true Bovine or Perlsucht Bacillus than he is when describing their morphology and cultural appearances. In the coaxial microscope by dark ground illumination the three forms appear thus:-

1. Koch's Brevis - Whitish yellow light, oval or catkin-formed, short rods, and splitter.

2. Humano-Longus - Long rods and threads with a quite weak yellow light, particles of all sizes.

3. Perlsucht - Dim, yellow rods longer by $\frac{1}{3}$ than T.B. (Koch's Brevis).

The latter two resemble one another by their darker yellow while the Brevis is lighter. The light protoplasmic central thread of the Brevis has round it a darker ring and round that again a bright oval ring. The H.L. and P.B. have central yellow wavy-edged protoplasm round which is a dark ring, then a yellow light band, and then on the outside a fine dark line. The toxins of the bacilli can also be distinguished by ultramicroscope. They are obtained from broth cultures, filtered, and diluted 1 in 10 with normal saline:-

1. Tubercle bacilli (Brevis) toxins - Show green light cone with numerous motile light reflecting greenish-gold particles.

2. Humano-Longue toxins - Show greenish blue light cone with fine particles (Körnchen).

3. Perlsucht Bacilli toxins - Show blue light cone with blueish gold motile bodies.

This/

This shows that H.L. is intermediate between T.B. and P.B. Spengler suggests that P.B. is H.L. altered by passage through cattle. He therefore regards the Bovine Tuberculins (e.g. PTO, PT) are less toxic than the Tuberculins from Human Bacilli (e.g. TOA, OT.)

Spengler considers that like other colloidal fluids the motile particles of these toxins as seen in the ultramicroscope for colloidal fluids are electrically charged bodies or ions. As ions they produce their toxic effects. The differences are due to the difference in physico-chemical qualities. As a control he examined the various constituents of the medium by the ultramicroscope with the following results:-

5% Somatose. Showed blue light cone with gold bodies.
5% Peptone. Ditto.
5% Liebig extract. (for TB broil -low only) Ditto.
Na Cl. One Korn.
2½ Soda. Ditto.
50% Glycerine. Ditto.
2% Glucose - Grey light cone with silver bodies.
Aqua. One Korn.

General mixture showed blue cone with gold bodies.

These results showed that the green of the Brevis and H.L. is specific while the blue of the P.B. could be got free from medium. These were compared with non-vital colloidal fluids electro-aurol, electro-argyrol and electro-mercurol. The former produces rose/

rose gold light with rose gold spores, the second silver light with blue-green film and the last rose light with silver bodies.

d. Injections into human beings:-

Spengler injected into himself some Humano-Longus culture. In 8 days he had a temperature of 104-105° F., severe dyspnoea, and almost fatal result. There were also severe muscular contractions of limbs. The same effect was produced in a person accidentally infected with H.L.

The result of the injection of the Bovine Bacillus was very different, evanescent fever, and local abscess. The apathogenicity of the Perlsucht Bacillus to man was also shown by Klemperer who injected several human beings with such, with no effect.

Klemperer[7] gave in 4 cases of Pulmonary Tuberculosis 39 injections of living Perlsucht Bacilli. The local reactions were very slight as a rule, but an abscess formed on 4 occasions. Sometimes there was a hardening of the tissues. No general reaction occurred. None of the patients were injured, but on the contrary they improved in subjective symptoms and put on weight. Klemperer therefore concluded that the injections of Perlsucht bacilli even in living condition into human beings were non-injurious within certain limits of dosage. He suggested the use of such injections for prophylaxis against and the treatment/

treatment of Pulmonary Tuberculosis.

Baumgarten found the same result where he used injections of Bovine Bacilli in some cases of cancer.

Otabe[7a] as the result of a series of experiments believes also that Bovine Bacilli are not infective for man and that human T.B. are not infective for cattle.

e. Animal experiments.

Koch's Brevis is pathogenic to man and guinea-pigs. Humano-Longus is pathogenic to man, guinea-pigs and rabbits. Brevis does not affect rabbits. True Bovine is apathogenic to man.

Results of experiments with H.L. on animals:-

Injected into rabbit subcutaneously into pocket in axilla (dry infection). Death from toxaemia in 14 days, guinea-pigs - death from general Tuberculosis. Injected as an emulsion into either causes general Tuberculosis.

Examples of experiments:-

A. Longus infection in guinea-pigs.

1. A loop H.L. (cov) subcutaneously into skin. Died in 10 days. Post Mortem, no Tuberculosis. Death from toxaemia.
2. Same amount of H.L. culture in normal saline intraperitoneally. Death 5 weeks. P.M. marked general Tuberculosis.
3. Same Subcutaneously. Death in 11 weeks from Tuberculosis.

H.L. therefore produces in guinea-pigs, if not killed by toxaemia, severe general Tuberculosis.

Where the H.L. was grown from H.L. Körner bodies, subcutaneously injected 1 loop, animal survived 4 months. This shows the bacilli from Körner are less toxic.

The suitability of the H.L. medium also affects its toxicity.

Good medium, marked toxicity, and vice versa.

B. Longus infection in rabbits:-

Dry infection H.L. (mic), death in a few days.

Infection with H.L. emulsion, death in 193 days.

This is due to the harmful effect of the diluting fluid of the emulsion on the H.L. bacilli. The diluting fluid destroys the capsule of the bacilli.

f. Serodiagnostic characteristics:-

Experiments show that the T.B. and P.B. form specific antibodies.

Extracts of organs infected with Tuberculosis agglutinate and precipitate test fluids of both T.B. and P.B. bacilli[o]. (Bonome.).

Serum of Pulmonary Tuberculosis cases agglutinates and precipitates test fluids of both T.B. and P.B. bacilli.

Organ extracts from animal Tuberculosis only precipitate and agglutinate P.B. test fluids.

Serum of cattle only agglutinates and precipitates P.B. test fluids.

Bovine Tuberculosis due to a single infection.

Of/

Of 46 cases of Pulmonary Tuberculosis tested, the serum of 45 of these gave plural agglutination. One agglutinated T.B. (Koch's Brevis) only.
These 45 showed both T.B. (Koch's Brevis) and P.B. bacilli in sputum. (P.B. here means Humano-Longus bacilli)
The other one showed only T.B. (Koch's Brevis) in sputum.
Spengler considers that in a case where in the sputum Koch's Brevis alone is present, the prognosis is much worse than where both Koch's Brevis and Humano-Longus are present.

IV. THEORY OF THE PREPARATION OF IK (IMMUNE BODIES) AND OF ITS ACTION.

Spengler considers that he has produced a complete immunity to Tuberculous living virus and that a complete immunity to Tuberculosis cannot be produced by injections of dead virus but only by living bacilli. He therefore considers Tuberculin cannot produce a complete immunity. His definition of immunity is that an animal shows complete immunity, when by the injection of immune bodies such animal can absorb without any signs of reaction a lethal dose of living virus, and the blood of such animal when transferred to another animal also causes this other animal to absorb living virus in the same way.

Spengler/

Spengler considers he could produce this complete Tuberculosis immunity in animals in 3 ways:-

1. By repeated injections of living Tuberculous virus into a rabbit's ear.

2. By intramuscular injection of living culture into muscles of rabbits.

3. By previous I.K. treatment and injection of I.K. along with living T.B. virus.

The second method is the most effective. The third method needs little further mention.

I shall describe the first method as carried out by Spengler, 20.12.1909. Rabbit was used. In a subcutaneous pocket of the Rear was injected a small loopful of 4 weeks old. HL (M.) Culture (containing long acid-fast threads and splitter). In control rabbit this was a highly toxic culture injected into axilla. Abscess developed about the size of a bean, which passed off slowly in 2 months. On 26.4.1910, injection into R. ear of 1 cc. of P.B. T.B. emulsion. No immediate reaction. On 27.5.1910 another tumour formed at site of former injection. On 8.6.1910 a small amount of (M.) culture in ear. Some reddening and infiltration - primary focus again reacted - 13.6.1910 pea-sized abscess. 27.9.1910, a small particle of culture H.L. (cov) in R. ear - primary focus again reacted - smooth absorption.

By this method of reinfection one caused the ultimate smooth absorption of living H.L. culture and cure of the former infections. It is similar to

to Tuberculin treatment.

Spengler to raise the immunity of this rabbit still further, on 11.6.1911 gave it an intramuscular injection of culture Ben, (= culture of H.L.) and culture Goldsteiner (= culture of H.L. and Koch's Brevis). This caused slight fibrous thickening.

Then he tested the animal later with infection again with a loopful of culture Goldsteiner and also later with loopful of culture of Perlsucht. On both occasions small caseous nodules formed.

Spengler then considers complete immunity thus produced, but to myself this is obviously doubtful. The immunity does not seem to have increased at all. After the first experiment on 20.12.1909 an abscess formed in the R. ear and after the last an abscess formed, i.e. Jan. 1911. Evidently the ear shows greater resistance than the axilla, but the immunity of the ear does not seem in itself increased.

2. The production of complete Tuberculosis immunity by means of intramuscular injections of living bacilli.

This method was evidently more successful. It is also more rapid. It is of more importance because it is the method adopted by Spengler in his preparation of I.K. as used in the treatment of human beings. Spengler used the muscular tissue as it has an inherent resistance to the Tubercle bacillus.

Rabbit/

Rabbit (black) received 17.1.1909 one loopful of culture H.L. (cov) in 9 divisions of sterile water finely emulsified, in the adductors of the thigh. There were no symptoms except rise of temperature which was normal after three months. Weight remained the same and after 5 months was increased. On 6.6.1909 (i.e. 4 months 10 days after the intramuscular injection) the animal was injected with a loopful of same culture which was shown very toxic in all the control animal experiments. The injection was made subcutaneously into the R. axilla. On 12.6.1909 slight local infiltration and small crust formed. On 23.6.1909 (17 days after the intramuscular injection) the local site was smooth and healed. The temperature showed after the injection no variation, the weight increased, appetite and general appearance of the animal remained normal. "Die einmalige intramuskuläre injektion einer emulsionierten Öse vollvirulenter Tuberkulosekultur ist somit instande, eine so hohe Immunität beim Kaninchen zu erzeugen, das eine nach 4 monaten vorgenomme subkutane Axillargegendinfection, die ohne Vorimmunisierung immer den Tod herbeiführt, vollkommen negativ verläuft." I have put this in Spengler's own words as it is the result of the animal experiment which is the foundation of the theory of I.K. treatment.

One injection intramuscularly therefore of a loop/

loop of emulsified fully virulent T.B. (Humanolongus) culture caused a high degree of immunity in rabbits so that 4 months later an injection into the axillary region subcutaneously of a dose fatal without immunisation caused no effect. This experiment is as important in the study of the theory of the principles on which treatment with I.K. rests, as the original experiments of Koch on reinfection of guinea-pigs were for the foundation of Tuberculin treatment. The blood of this immunised rabbit was tested for Immune bodies by precipitation, lysin and agglutinin tests and found to contain as many of these as normal healthy Immune blood.

Animals treated with high dilutions of the blood were also found to be quite refractory to fully virulent culture.

To prove the animal was completely immune, it was killed 1 year 4 months after the preliminary intramuscular injection. No trace of Tuberculosis was found in any of the organs post mortem.

The blood of such an animal contains the I.K. (Immun-Körper) immune bodies against Tuberculosis and in a suitable form can be used for treatment. When obtained in this form it constitutes the I.K. used in therapeutics for Tuberculosis. According to Spengler these immune bodies are present in the red-blood-cells but I shall describe later the method of extraction, preparation/

preparation and use of this Immune Blood.

Spengler considered that this Immune Blood had marked powers of agglutination and precipitation to T.B. test emulsions, but that the chief property is its power of lysinising T.B. bacilli along with antitoxic power. He considers there are two forms of immunity, lytic immunity and antitoxic immunity. The possession of the former alone is worse than no immunity at all. If the bacilli are killed by the lytic power of Immune blood endotoxins are set free, and if there are no antitoxins present in the Immune Blood to counteract these toxins the animal will die from acute toxaemia or "acute lytic death". That such a death from acute lysis does occur is shown and proved by animal experiments by Spengler in his experiments with Phthisin.

Phthisin is a special Tuberculosis toxin prepared by Spengler from a symbiotic culture of Perlsucht and ~~Humano-Longus~~ Koch's Bovis bacilli grown on HL medium altered in quality by PB growth. It differs under the ultramicroscope from toxins of either bacillus separately. It is prepared in a special manner so that .1 cc of it = $\frac{1}{10}$ mgm. is the lethal dose for rabbits.

A guinea-pig was taken. It received $\frac{1}{10}$ mgm. of Phthisin on 2.12.1907. 14 days later it had injection of culture of H.L., absorbed without reaction. In January further infection, no result. 4th February another H.L. injection - animal died in 19 days. Post Mortem no Tuberculosis, organs hyperaemic, one gland/

gland showed small softened focus. Death due to acute lysis of the H.L. bacilli and toxaemia. The previous Phthisin injection had produced a partial lytic immunity with lysis and death as the result. An almost similar result was produced where Phthisin was followed by injection of Koch's Brevis.

Spengler has shown by numerous animal experiments that I.K. has the following properties:-

1. Lytic power.
2. Antitoxic power.
3. Immunising power.

No.3 includes both the former.

1. Lytic power:-

a. Guinea-pig (16.1.1909) inoculated subcutaneously with one loopful of a symbiotic (Phthisin) culture mixed with 1 cc. of 100-fold dilution of Immune Bodies and ground down in agate mortar.

On 20.2.1909 death from toxaemia.

P.M. Organs congested, no trace of Tuberculosis. Control guinea-pig with same amount of Phthisin died in 17½ weeks from Tuberculosis of the lungs and liver, also spleen. The IK. caused lysination of the bacilli in the Phthisin and acute lytic death.

b. A control experiment in the process of immunity produced by intramuscular injection shows the extraordinary lytic power of IK.

Instead of receiving the intramuscular injection of/

of some H.L. only the control rabbit received one loop-ful of H.L. culture in 9 cc. Aq. Dest.+ .1 cc. of 100,000th million-fold dilution of IK. The animal died in 3 days from very acute lytic toxaemia. P.M.:- no sign of Tuberculosis - organs congested.

c. Landmann showed the high lytic power of IK:- The lethal dose for rabbits of his Tuberkulol B. is 1 cc. When injected by itself the rabbit died in 4 days.

If the Tuberkulol were mixed with 1,000,000 fold dilution of IK, death in 24 hours.

The lysins of the Immune blood lysinised the Tuberkulol and made it more toxic.

d. We shall see later in the description of immunisation by IK. mixture with living virus the lytic power of IK. Also when we come to consider the mode of action of IK. in treatment we shall see that it partly depends for its efficacy on lytic action and that lytic action occurs in human beings during treatment.

2. Antitoxic power:-

This can be shown by its antitoxic effect on dead Tuberculosis toxins.

a. On Phthisin.

b. On Tuberkulol.

a. Phthisin experiments:-

One division of syringe containing the antitoxin element mixed in a glass syringe with fatal dose of Phthisin/

Phthisin ($\frac{1}{10}$ mg. = 1 div.) and injected subcutaneously.

Rabbit (1) 1 div. Phthisin + 1 div. 100,000-fold dilution Immune Blood serum.

Result: Death 4 weeks later with sharp fall of temperature.

Rabbit (2) 1 div. Phthisin + 1 div. 100-fold dilution of Immune blood. Animal survives. The temperature chart did not show complete antitoxic power as it shows deviations due to toxaemia.

Rabbit (3) 1 div. Phthisin + 1 div. 100,000-fold dilution IK. orig. - animal survives - antitoxic power still incomplete.

Rabbit (4) 1 div. Phthisin + 1 div. 1,000,000-fold dilution IK. orig. - animal survives - no temperature deviations - antitoxic power complete.

Rabbit (5) 1 div. Phthisin + 1 div. 10,000 million-fold dilution of Immune blood dialysate. Same result as No.4.

Rabbit (6) 1 div. Phthisin + 100 million-fold dilution of extract of white-blood-cells and blood-plates of Immune blood. Same result as (5) and (4).

Control experiments:-

Similar rabbits injected with Phthisin alone. Death in 2 - 4 days. (See later more powerful antitoxic effect of Immune blood than Immune blood serum).

b. Tuberkulol experiments:-

Guinea-pig (1) 2.4 cc. Tuberkulol B. + 1 div. IK.

(9)/

(9) - definite illness 24 hours after, no appetite, recovers and survives, skin necrosis.

Guinea-pig (2) 1.2 cc. Tuberkulol B.+5 div. IK. (8). 24 hours slight illness - recovers and survives - slight skin necrosis, disappearing in 14 days.

Guinea-pig (3) 2.4 cc. Tuberkulol C.+.5 cc. IK. (7) - no definite illness - survives. Trace of necrosis, healed in 14 days.

Guinea-pig (4) 2.4 cc. Tuberkulol C.+.5 cc. IK. (6) - no illness - slight thickening of skin.

Guinea-pig (5) 1.2 cc. Tuberkulol C.+.5 cc. IK. (5). No illness - no local reaction.

If guinea-pig receives 2.4 cc. of Tuberkulol alone, it shows after 24 hours slight illness, recovers and survives. This is interesting because the lethal dose is 1 cc. Spengler considers that Tuberkulol is like Phthisin and possibly T.B. toxins in general and that it does not follow the law of multiplicity. Medium doses are lethal, but increasing doses cause immunising effects.

When IK. is added to Tuberkulol as we saw before, animal usually dies in 24 hours, but Spengler considers the above results are due to an increased antitoxin content in his later IK. overcoming the lytic effect. We shall see also that in the treatment of human beings with IK., antitoxin effect is present.

3. Immunising Power:-/

3. Immunising Power:-

This is shown by the following animal experiments in which Immune blood is tested by previous IK. treatment followed by injection of T.B. virus.

a. On 16.10.1909 a rabbit received 1 cc. of (6) dilution IK. subcutaneously.

24 hours later the animal with a control animal received 1 loopful of culture (cov) H.L. in axilla subcutaneously.

The control animal presented a strong local infiltration and died in June of general Tuberculosis.

The animal which received the preliminary dose of IK. showed a minimum local reaction and survived; 6 months after the death of control it showed no sign of disease.

On 6.12.1910 it received an intradermal injection of $\frac{1}{2}$ cc. emulsion in Normal Saline of loopful of M. culture. A small non-progressive nodule formed. High degree of immunity produced even 14 months later.

b. The immunity produced from previous I.K. immunisation is shown by test infection in the ear. The process can then be watched:-

a. A grey rabbit was taken and previously immunised with .2 cc. of dilution (7) of I.K. subcutaneously. Test infection made with $\frac{1}{2}$ cc. of culture H.L. (cov) in R. ear subcutaneously. 3 days later redness at site of injection, - 4 days later redness and heat, -

5/

5 days small nodule, - 4 weeks nodule hard and non-irritating, - 8 weeks nodule quite smooth.

2. 2 Rabbits taken - subcutaneous dose of .2 cc. of dilution (2) IK. - test infection 48 hours later in same way, same amount - 5 days later heat and redness locally - 8 days small nodule - 4 weeks nodule gone.

3. 3 Rabbits (white). Previous immunisation .1 cc. IK. original - 48 hours later same test infection - in 3 days local redness - 8 days small nodule - 6 weeks nodule gone.

In all the experiments as the result of the previous immunisation with IK., the animals absorbed smoothly living T.B. virus.

The dilution (2) produced the most powerful immunising effect. IK. in these experiments agrees with all recognised immune substances in that the preventive effect is greatest if given shortly before infection.

c. The third method of producing Tuberculosis immunity must just be mentioned because in the experiments done by Spengler for this purpose he showed the lytic power of IK. (see under "Lytic power of IK.") at the same time as he showed its immunising power.

The following experiment shows the lytic effect of IK.:-

On 12.10.1908 guinea-pig had .9 cc. H.L. emulsion (loopful of culture) with .1 cc IK. (5) injected intra-/

intraperitoneally. Control animal had the same but without the IK. The control animal died in 37 days from severe general Tuberculosis of lungs, pleura, liver, spleen, peritoneum, and bladder. Numerous bacilli present. The other animal which had the IK. also died sooner. Only slight Tuberculosis was found Post Mortem - bacilli few. The death was due to toxaemia. The result was due to the lytic effect of the IK. on the H.L. culture. This (5) dilution of IK. therefore had a definite bactericidal power, but no accompanying antitoxic power.

The immunising effect of previous IK treatment is shown by this experiment, a sequel of the last: the third method of producing immunity:-

Animal received previous IK. injection. At a later date the same rabbit received injection subcutaneously of 1 loopful of culture H.L. (M.) in .15 cc. sterile water + .15 cc. IK. original. In this case lytic death did not occur as above. The animal survived. If the IK. is injected even one minute before the injection of IK. with living virus, lytic death is prevented.

V. SEAT OF PRODUCTION OF IMMUNE BODIES OR I.K.:-

Having defined the nature of the bacilli against which the Immune bodies in IK. are effective, and having explained the methods of immunisation in animals by/

by which the immune bodies are produced, as well as having shown the effective qualities of such bodies, it is necessary to show where these immune bodies are formed and how they are produced. Spengler considers that the seat of production of the immune bodies against Tuberculosis are the Red-Blood-Cells. By experimental methods he showed that in many instances the Red-Blood-Cells contain a million times more immune substances than the corresponding serum. For that reason he does not use Immune Serum but Immune Blood itself. In normal men and in men and animals immunised against Tuberculosis the chief seat of production of Immune Bodies is the Red-Blood-Cells. The White-Blood-cells and Blood Platelets act as carriers of the Immune bodies. Sewastianoff considers the Red-Blood-Cells are the natural carriers of protective substances (Wien, Klin. Rundschau 1909; No.26 - 29). If one injects Tuberculin (antigen) there is 20 minutes afterwards a marked fall in Immune bodies in the Red-Blood-Cells accompanied by haemolysis and an increase in the Immune Bodies in the serum. If tests are carried out later there is a fall of Immune Bodies in serum and an increase to normal or over normal of Immune Bodies in the Red-Blood-Cells. The Red-Blood-Cells in haemolysis give up their Immune Bodies to the serum.

These facts are shown by agglutination, precipitation, lysin and antitoxin tests of the various components/

components of the blood. The blood must for this purpose be divided into its component parts, Red Blood Cells, White Blood Cells, Platelets and Serum. The finger is pricked, blood is aseptically withdrawn, mixed with .5 carbolic normal saline in proportion 1 - 10. It is then centrifuged, serum decanted off, .2% Formalin is then added. This dissolves the Red Blood Cells, centrifuge, and decant the Red Blood Cells - White Blood Cells left as grey deposit. The serum of immunised animals and men agglutinates Koch's test fluid (See XIVb) = emulsion Kabi TB. when the serum is diluted 1 in 1000 to 10,000, but not at higher dilutions. The Red Blood Cells extract on the other hand agglutinates often when in dilutions of 100 million. The power of precipitation is about the same. IK therefore contains agglutinins and precipitins.

VI. CHIEF IMMUNE BODIES PRODUCED, GIVING IK. THE ABOVE PROPERTIES:-

The more important Immune bodies to be tested for - than the agglutinins and precipitins - are the lysins and antitoxins. The optimal dilution for lytic and antitoxic qualities in highly Immune blood lies between 100,000-fold dilution and 1000 million-fold dilution. They seem to increase in effect with dilution of the blood owing to dissociation. Spengler only tests IK, for its lytic and antitoxic powers before/

before sending it out for use. The lytic power of the IK. or Immune blood is tested by a series of cover glass preparations. The Immune blood is diluted in proportions of 1-1000 up to 1000 million. A not dried pure culture T.B. bacilli and Perlsucht bacilli is taken respectively. A drop is taken from each dilution of the Immune blood and put each on separate coverglasses and mixed with same amount of bacilli. Bacilli and drop are well mixed on the coverglass. They are left in the incubator 37° C. A control is also made. All are stained by proper staining methods for T.B. The optimum of the lytic effect and the lytic titre of the Immune blood is shown in the preparation in which the bacilli capsules are dissolved so that only unformed red stained capsules are seen and no formed bacillary rods. This optimal lytic effect is usually seen in highly Immune bloods in dilutions of 1,000,000 and 100,000,000. The titre of the undiluted Immune Blood is thus obtained, e.g. optimal lytic effect in dilution of 1 in 10,000,000 has in 1 cc. original undiluted Immune Blood 100,000,000 lytic units.

The antitoxic titre is estimated by animal experiment. Standard rabbits are used. Lethal doses of Phthisin are injected along with equal amounts of increasing dilutions of the Immune blood. From the last highest dilution which prevents the lethal effect/

effect of the toxin (Phthisin) in the rabbit, one can estimate the antitoxic titre of the given Immune blood or IK. e.g. One division (.1 cc.) of the 100,000,000 fold dilution still prevents lethal action, then in 1 cc. of the corresponding undiluted Immune Blood are 1,000,000,000 antitoxic units.

The IK must also show a standard combined lytic Antitoxic strength before use. The IK (diluted 1 million times) injected into healthy rabbit 24 hours before subcutaneous injection (in ear) of loopful of living TB culture emulsion must prevent any symptoms

VII. THE PREPARATION OF I.K. IN A FORM FOR USE IN TREATMENT AND ITS DETAILED DESCRIPTION:-

The blood of the rabbit immunised by intramuscular injections of living Tuberculous virus was originally used by Spengler free from Haemoglobin. The immune bodies were extracted from the cells and used as a clear fluid. More recently he has retained the Haemoglobin and used the general blood. The rabbit's ear is shaved, disinfected, vein incised and the blood collected in highly diluted (1000000 times) carbolic normal saline and acidified with lactic acid. (.5% carbolic, .5% normal saline, 1.5 - 5% lactic acid). The blood prepared thus keeps sterile. The acid is said to prevent the toxic anaphylactic effect of the injection of animal albumin in another animal. This blood is tested for its lytic and antitoxic titre as described in the last paragraph. It is put in sterile bottles ready for use. If alkali or glycerine were used the lytic power is increased. Ultramicroscopic examination shows that dissociations of lysins is much greater in alkali

than/

than in acid. Spengler does not efficiently explain how the alkaline blood stream after the injection does not in any case cause severe lysis. Increase the acidity of IK., and one decreases its lytic power; diminish the acidity and one increases the lytic power. In early cases, where perhaps some degree of lysis is desirable, one might use the more alkaline IK. This can be done by adding 1 or 2 drops of 5-fold diluted soda solution to each cc. of IK. So much must never be added to render the reaction of the IK. alkaline.

IK. is obtained for use from the firm of Kalle & Co., Biebrich-am-Rhein, Germany. The agents in this country are Messrs Zimmermann, London. Since the outbreak of War, IK. is obtained from the Kalle Chemical Co., New York.

It is sent out in the original undiluted form in sterile glass bottles containing 1 cc. The titre of lytic-antitoxic power is marked on the label.

1 cc. of the original IK. contains 1,000,000 lytic-antitoxic units. (original Rabbits blood diluted so that it complies to this standard in units gohen tested as in Chap VI.)

It is also sent out in dilutions 1 to 5, but it is better to make one's own dilutions from the original IK.

VIII. PHYSICAL PROPERTIES AND REACTIONS OF IK.:-

1. It is a clear fluid with acid reaction. SG. 1,004

2. It remains clear on boiling.

3. Through addition of 1 drop of saturated soda solution/

solution per cc. of IK. the fluid is rendered slightly opalescent, and after 24 hours in the incubator Haemoglobin and colloid substances are precipitated. Under the ultramicroscope these are seen as roundish and longish bodies with a dull yellow light.

4. Coagulation test with concentrated H N O3, slight ring of albumin (not soluble on warming and no yellow colour).

5. IK. is negative to Esbach.

6. Millon's reagent. Precipitation on boiling typical, not very red colour.

7. Potassium Ferrocyanide and acetic acid, negative.

8. Biuret reaction, slightly positive (violet colour, not reddish violet).

9. Boric lead acetate. Precipitation, soluble in excess.

10. Teichmann's reaction not quite typical. No crystals of methaemoglobin appear, but amorphous methaemoglobin lying among crystals of NaCl. Microscopic and ultramicroscopic properties.

In dry preparations of IK. flooded with Carbol-Fachsin, washed, and dried, are found amorphous particles, seen in dark field with ultramicroscope as granules. Separately they are recognised as capsules of Red Blood Cells in layers and also as uninjured Red Blood Cells. The ultramicroscopic/

ultramicroscopic colloidal investigation of IK. is of great interest. It has the physical properties of an electro-colloidal fluid.

Original IK. (acid):- Dark violet light cone with whitish violet reflecting particles showing fine movement. The particles are of three sizes.

Original IK. (alkaline):- Dark rose light cone. Particles with bright whitish gold light, in shimmering motion, mutually attracting and repelling one another, without doubt electrically charged ions.

IK. is very strongly dissociable and dissociates with increasing dilution. It is probable the height of dissociation is directly proportional to the amount of immunity.

IX. DILUTION OF IK. FOR CLINICAL USE:-

The dilutions can be made from the original IK. The diluent used is .5% carbolic in normal saline. The original IK. keeps for months but the dilutions do not keep. The dilutions are best made with an ordinary 1 cc. syringe divided into $\frac{1}{10}$ cc. or $\frac{1}{50}$ cc., such as the Record Tuberculin syringe. The syringe should be boiled and then kept in absolute alcohol. Seven small 10 cc. glass-stoppered glass bottles must be sterilised by boiling for 20 minutes in steriliser and then dried and kept sterile. Take up .1 cc. of IK. original in syringe, then .9 cc. of diluent. This/

This forms Dilution (1). 1 cc. of this dilution then contains a dose of .1 cc. IK. original. .1 cc. will contain .01 cc. of IK. original.

Label bottle IK. (1) .1 - .01 cc. and put date of making dilution on the lower part of label, e.g.

Mix IK. and diluent thoroughly by shaking the bottle. Then take .1 cc of IK. (1) add in same way .9 cc. of diluent. This forms Dilution (2) .01 - .001 cc. Dilution (3) is made in the same way from (2) and so on until one reaches Dilution (7).

The series then is:-

IK.(original)	1 cc - .1 cc
IK.(1)	.1 cc - .01 cc.
IK.(2)	.01 cc - .001 cc
IK.(3)	.001 cc - .0001 cc
IK.(4)	.0001 cc - .00001 cc
IK.(5)	.00001 cc - .000,001 cc
IK.(6)	.000,001 cc - .000,0001 cc.
IK.(7)	.000,0001 cc - .0,000,0001 cc.

Each dilution is 10 times stronger than the preceeding one.

X. METHOD OF USE OF IK. IN PRACTICE:-

We have now to consider the method of using IK. in practice.

A.:- Clinical data of patient required before administration/

administration of IK.:-

One must be sure of the diagnosis of the case as Tuberculosis. Before commencing treatment one must have a definite idea of the condition of the case. One must have a record of the temperature for a complete fortnight before starting IK. The temperature can be taken by the mouth, keeping the thermometer under the tongue of the patient for at least 5 minutes. The temperature should, if possible, be taken 4 hourly - 8 am - 12 noon - 4 p.m. - 8 p.m. It may also be taken at other intervals between these hours if the patient feels at all out of sorts, e.g. at 9 or 10 p.m. or during the night in condition of insomnia. Often these irregular temperature records give one the most important data. During the observation period, of course, the true temperature curve must not be affected by the use of antipyretics. Spengler divides the cases into 3 classes according to the average temperature in the evening:-

Afebrile - Temperature not over 37° C.
Subfebrile - Do. " " 38° C.
Febrile - Do. over 38° C.

The pulse must also be carefully recorded and a continuous estimate of the weight of the patient kept.

There must be an accurate description of the physical signs in the chest with a pictorial chart representing such before commencing treatment.

We must also carefully examine the sputum.
1. For presence of Tubercle bacilli and their number

according to Gaffky's scale.

2. For presence of Secondary organisms.

3. Nature and quantity per diem of sputum.

4. Presence of splitter bodies in sputum.

5. Extent of phagocytosis in sputum.

6. Nature of cells in sputum.

7. State of sheaths of bacilli in sputum.

8. Predominant type of bacillus.

In doubtful cases all possible methods of diagnosis should be made use of. This will require often the use of the various specific diagnostic tests, where these are not contraindicated, e.g. the subcutaneous Tuberculin test, Von Pirquet test or Calmette's test.

In cases where it is doubtful if one is dealing with a case of chronic Bronchitis or with Pulmonary Tuberculosis the albumin test applied to the sputum will often be of value. Opsonic index estimations may be of assistance.

Spengler's rapid precipitation test is useful. Indeed all means must be taken to ensure accurate diagnosis of the presence of Tuberculosis before starting the use of IK.

B. Indications and contraindications to clinical use of IK.

a. Indications for IK.:- It ought to be specially useful in cases which are unsuitable for Tuberculin. Such/

Such cases are unsuitable for attempts at producing active immunity by Tuberculin owing to lack of resistance. IK. causes a passive immunity and therefore a patient who is so exhausted that he cannot produce his own antitoxins should have such antitoxins supplied to him ready made as in IK. Of course IK. also depends to some extent on an active immunity. There must be some power of resistance to the lysis which occurs and causes a lytic reaction. One would expect IK. therefore to be useful in cases of Turban, III, where disease is active and advancing owing to the complete absence of resistance of the patient. Such cases include those with marked toxaemia, high temperature, rapid pulse and advancing physical signs. Improvement under IK. in such cases would justify its supposed antitoxic qualities.

Also in early cases where active response is quite desirable a more lytic IK. is useful. Lytic focal reactions are caused and act as a stimulus to the formation of antitoxins to the lysinised endotoxins set free from the Tubercle bacilli killed by the lysis.

IK. can be used in ambulant practice in early cases and in not too advanced cases. Fearis recommends[8a] IK. in dispensary work: so also does Wolff.

b. Contraindications to IK.:-

There are said to be no contraindications to the use of IK. in Pulmonary Tuberculosis. Most cases will/

will benefit from its employment unless they are hopelessly far advanced with severe complications such as waxy disease or renal complications or very severe exhaustion. Spengler gives no instructions regarding the use of IK. in cases with much haemoptysis, but I should consider the danger of causing lytic focal reaction in such cases would make such cases unsuitable for IK. Cases with advanced uncompensated heart disease are unsuitable for treatment with IK.

C. Methods of administration of IK.:-

a. Subcutaneous.

b. Percutaneous or Inunction.

c. Oral.

a. The usual method is the subcutaneous method. The injections are made subcutaneously under the skin of the extensor surface of the forearm in a centrifugal direction or they can be made into upper arm.

The arm must first be cleansed at site of injection with 2% Lysol, Absolute Alcohol, or Ether. The injections are made with a Record Tuberculin syringe kept sterile in Absolute Alcohol. The needles should be of platinum-iridium and kept sharp. Before using the syringe on another case the whole of the needle should be immersed once or twice in absolute alcohol and some absolute alcohol drawn up into the syringe barrel once or twice to thoroughly cleanse the interior. Before drawing up the dose of IK. into the syringe for the/

the next case be sure that it is emptied of the absolute alcohol and wash out the barrel with the sterile diluent.

b. Percutaneous or Inunction method.

IK. can also be administered by inunction or percutaneously.

Incorporate the dose of IK. to be given in some pure lanoline and rub into the flexor surface of forearm until all is absorbed, i.e. till skin is dry. The volume of the dose must be kept small. The skin must be healthy and capable of absorption. Old shrunken skin is useless for this method. It is therefore most employed in children and adults afraid of injections.

c. The Oral method.

IK. can be given per os in same doses and at the same intervals as subcutaneously. A small quantity of water is added to the prescribed dose of IK. and the mixture taken preferably between meals, i.e. during the morning, afternoon or evening.

Given per os it causes no by-effects; only those with abdominal disease show more intense local reactions at the seat of disease than when given percutaneously or subcutaneously.

Local reactions in those cases which only react feebly once or twice are sometimes helpful as improved appetite and digestion often follow. If the reactions are/

are stronger it must be stopped per os and given by subcutaneous or percutaneous method.

In glandular Tuberculosis patients sometimes show stronger reactions per os than when given percutaneously or subcutaneously, followed by definite improvement of the swollen glands.

The IK. is not further dissociated in the stomach by digestion. It is probably absorbed by the stomach as there is an increase of Immune bodies in blood within half-an-hour after dose per os.

D. Dosage.

There are two recognised methods of dosage, - gradual and rapid methods.

a. Gradual method.

This can be used in all cases without danger. One starts with .2 cc. or .5 cc. of dilution (5) (rarely 6 or 7 dilution) and increases the dose by .1 cc., .2 cc. or .5 cc. every 3 - 8 days. When one reaches 1 cc. of a dilution one can pass on to .2 cc or .5 cc of the next higher dilution. Thus one gradually passes up to the stronger strengths till 1 cc. of IK. original is reached. This is the maximum dose for adults.

The maximum dose for children is .1 cc. or .2 cc. of IK. original.

After such a series of injections one can wait for some months and if any reappearance of symptoms the/

the course of injections is resumed in the same way till patient is cured.

Each case must be treated individually on its own merits. A hard and fast rule of dosage is not laid down. The commencing dose, maximum dose, increase of dose and intervals between dosage will all vary according to the case.

It is important to wait for at least 7 or 8 days after the first injection. We can thus decide more accurately the amount of lytic action and the power of resistance of the patient.

Wallerstein of Moscow[9] who used IK. with great success says that the most difficult point in the use of IK. is the question of dosage.

The above method of gradual dosage is the method advanced by Spengler in his more recent article (1911) on the use of IK. This was with the more recent preparation of IK. which contains the whole Immune blood acidified. In his article of 1908 he used IK free of albumin and haemoglobin. In this article he advised starting with dilution (4) or (5) increasing at 1, 2 or 3 days interval by .1, .2 or .5 cc. (rarely 1 day interval). In children he advised starting with .2 cc. (5). This method of use of 1908 is not advisable.

Wallerstein started usually with dilution (6) or (7) and increased .1 - .3 cc. every 2 or 3 days. That was his method originally. He then visited

Davos/

Davos and altered his dosage as result of his visit. He then commenced in all severe cases with dilution (7) and injected according to general conditions .2 - .5 cc. increase. He always waited 8-10 days after the first injection and regards this as all-important. He increased at the second injection by 10 fold greater dose and then increased at 10 fold or 100 fold at 6 - 5 - 4 days interval, usually 10 fold. On reaching original IK. he used .1 - .2 - .5 - .8 - 1 cc at 7 or 8 days interval. This is the rapid method of dosage which I shall describe later.

Wallerstein criticises the dosage used by Roepke as he increased the dose every second day, at first slowly and then more rapidly and never made use of the observation period after the first injection.

If lytic reactions occur, Spengler advises the giving of what he calls (eine entlastung injektion) a relieving injection. The symptoms of lytic reaction thus requiring relief are rise of temperature, great increase in cough and expectoration, toxic symptoms, e.g. insomnia, tiredness, headache and malaise. If these do not disappear of their own accord in 6 or 8 days, then a relieving injection is given. This consists of the injection of a minimal dose - .2 or .5 cc. of dilution (7) or (6) and then increasing again after 6 - 8 days. The effect of this relieving injection is prompt if the high doses have been/

been reached before the lytic reaction occurs, but if it occurs during the administration of the weakest dilutions the relief is often attained by increase in the dose. Both Wallerstein and Hollós found prompt relief obtained by such relieving injections. Hollós seemed to be able to produce lytic reactions at will and then as certainly relieve the toxic symptoms by relieving injection. It is not necessary nor desirable that in the course of treatment such lytic phenomena should occur.

b. Rapid method.

The gradual method of dosage avoids reactions but is slow. It can be shortened by the rapid method. Start with .2 or .5 cc. of dilution (5) (sometimes (6) or (7)) next dose 10 fold in some cases 100 fold, i.e. 2 cc or .5 cc of the next higher dilution. Meantime the volume of the dose remains the same, e.g.:-

.2 cc. (7) 3 days interval.
.2 cc (6) Do.
.2 cc (5) Do.
.2 cc (4) Do.
.2 cc (3) Do.
.2 cc (2) Do.
.2 cc (1) Do.

On reaching the original IK. one adopts the gradual method:- .1 - .2 - .3 - .4 - .7 - .1 cc(IK. original) at longer intervals (8 days). An interval of/

of 8 days must be made between doses .2 cc. (7) and .2 cc. (6). Also intervals of longer duration must occur if lytic reactions take place when relieving injections required.

c. Percutaneous or Inunction method.

This is the most useful method in children and adults who dislike injections.

It is rubbed into the skin of the forearm on flexor aspect. In adults one can use the original solution straight off by inunction. In children it is better to give the same dose as by gradual method or rapid method in subcutaneous administration.

Often if inunctions are doing good in adults it is unnecessary to pass over to the injection method. Inunction method is useful in hyper-sensitive cases. An inunction is often useful in taking the place of a relieving injection.

The inunction should be made every 8 - 14 days. In chronic mild cases the inunctions are made every 8 - 14 days while in more acute cases they are made oftener. Hollo's[10a] used inunctions with good effect in cases of doubtful Tuberculosis where the symptoms were vague symptoms suggestive of Tuberculous toxaemia. He practically used the inunctions prophylactically. He gave the patients a solution of (IK. 30-40,000th dilution) with instructions to rub in 5 drops on the forearm till quite dry. The patient kept a record of temperature, pulse and weight; and was examined at/

at the end of 3 months.

IK. can be used by direct application of the original solution into ulcers of the mucosa for example. Its effect in such cases is not purely cleansing and mechanical. It has the same directly lytic effect as it has on the bacilli in vitro.

Type of cases for the various methods:-

The rapid method is specially useful for early cases, initial, afebrile and sub-febrile cases without severe clinical symptoms. It is more liable to cause lytic reactions than the gradual method which should rather be used in the advanced febrile cases. Sometimes however it is wise to use the rapid method with care, even in advanced cases where a degree of immunity is desired quickly, e.g. in febrile cases with Tuberculous larynx. Lytic reactions of a severe nature must be then avoided with care.

In children and adults with acute Bronchitic symptoms it is often unnecessary to go beyond the (7)-(6),(5),dilutions.

The intervals between doses depend on the general condition and resistance of the patient. IK. acts actively and passively. The active stimulation of the Red Blood Cells by the neutralised toxins indicates that they require a rest from time to time. These intervals depend on response of patient. If the Red Blood Cells are so feeble that they can only produce/

produce small amounts of Immune bodies then they require less rest interval. In such cases IK. acts at first as an entirely passive immunising agent and the intervals between the doses must be short. Then as the Red Blood Cells recover they respond more, do more work, and the interval of rest must increase. The greater the response, the greater the interval between doses.

Neutralised toxins such as are active when IK. is used are regarded as potent in the stimulation of antitoxins as virulent toxins and are less harmful. On this principle therefore IK. has the advantage over Tuberculins which are unneutralised toxins causing active immunity. For the same reason we use sensitised vaccines.

S.B.E. (Sensitised Bacillary Emulsion) is regarded as an improvement on the ordinary B.E. In S.B.E. the dead Tubercle Bacilli are sensitised by shaking them up in the incubator in contact with the corresponding serum rich in antibodies, lysins, agglutinins, opsonins, precipitines and antitoxins.

d. Awtokratoff's[11] method.

He treated 800 cases of Tuberculosis in the Siberian mines with marked success.

In less serious cases he uses the doses:-
.2 cc IK. (7) - .2 cc IK. (6) - .2 cc. IK. (5) - .2 cc IK. (4) - .2 cc IK. (3) - .2 cc. IK. (2) - .2 cc IK. (1) every 2 days.

If/

If effect is marked and temperature fallen then he gives after 3 - 8 days at 4 days interval .1 cc IK. original - .2 cc IK. (orig.) - .3 cc IK. (orig.) This ends the ascending series of doses. If result is good, stop 2 - 3 weeks and then do same series again. If no effect, then 4 days later he descends in series at 2 days intervals:-

.1 cc IK. (orig.) - .2 cc IK. (1) - (2) - (3) - (4) - (5) - (6) - (7).

After this descending series a fairly long interval is allowed. Then he uses ascending series again.

(In more serious cases he uses the gradual method.) This somewhat resembles Spengler's rapid method.

e. Lukin's method[12]:-

Starts with dilution (7), waits 8 - 12 days after first injection. He then injects every 8 - 10 days and increases the dose 10 fold each time until IK. original is reached. If there is no reaction of any kind he pushes it, increasing 100-1000 fold each dose. In bad cases he gives .2 cc then .5 cc of each dilution; in milder cases he goes on from .2 cc of one dilution to .2 cc of the next; or, .5 cc of one to .5 cc of the next. If a reaction occurs he goes back 2 dilutions, e.g. .2 cc (4) gives reaction next dose is .2 cc (6). If loss of weight or subjective symptoms he goes back in the same way. On reaching dilution (1) he goes back again to dilution (3) and then/

then rises up again. He uses the original with care. If .5 cc IK. original gave a reaction he goes down to .5 cc IK. (2). He employs the following method of dosage when the original IK. is reached.

.1 - .2 - .4 - .7 - 1 cc or

.1 - .2 - .2 - .4 - .4 - .7 - 1 cc.

In some cases Lukin could get no reaction at all. There are 3 ways of getting reactions:-

1. Increase the lytic action of IK. by lessening its acidity.

2. Repetition of the same dose, especially if the dose is a small one.

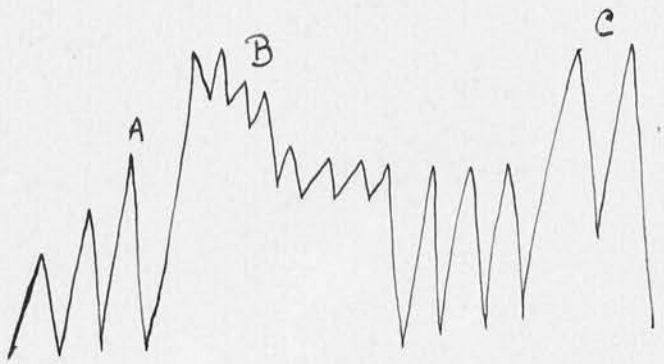
3. Increase the dose 10-fold each time till the original IK. is reached, then go back at one step to the original dose and then increase 100 or 1000-fold each time.

It is not advisable in using IK. to repeat the same dose, especially if the dose is small. One can repeat the highest doses at longer intervals, e.g. 1 cc IK. original every 14 days. Even then it is often better to lower the dose and rise up again to the highest dose.

The action of IK. is in some respects the opposite of Tuberculin. If the patient is feeling worse Tuberculin is with-held. If the patient feels worse and temperature up, a dose of IK. is administered. Armstrong does not give another dose so long as the good effect from the previous dose is maintained.

When/

When the good effect ceases he gives the next injection. One must distinguish between a rise of temperature due to lysis and an advance of the disease:-



A - B is the positive period of lytic toxic reaction due to dose of IK. B - C is the negative period of reaction, temperature falls. After C temperature rises again not due to IK. but due to disease advancing. No injection should be given during A-B nor during B-C. During B-C the cells are to rest and make use of the improvement denoted by the fall of temperature and less lysis. Inject at C with a dose 100 - 1000 less than the last dose which caused the reaction. A-B corresponds to what is usually called the "negative phase".

Lengthening of pause between doses:-

1. In severe cases after defervescence sets in.

2. In first observation period between first two injections.

3. To make use of good results attained.

4. After lytic reactions.

f. Commencing dose used by different physicians varies:-

.000,001 cc - Spengler

.000,000,02 cc - Awtokratoff

.000,000,02 cc - Lukin

.000,000,01 cc - Wallerstein

.000,001 cc - Kerlé[13]

.000,001 - 2 cc - Simon[14]

.000,001 cc - Brauer[15]

.000,000,02 cc - Eversole and Lowman[16]

.000,001 cc - Roth[17]

.000,025 cc - Benoit[18]

.5 cc IK. (1 in 300,000) - Dresdner[19]

.000,001 - .000,0001 cc - Hollós

.000,001 - .000,0001 cc - Wolff[20]

.001 cc - Roepke[21]

The commencing dose which I use I vary according to the case:- .1 cc (4) (5) (6) or (7).

All writers seem to restrict the maximum dose to 1 cc of IK. original.

E. IK. as a diagnostic agent.

Spengler considers it is quite useful as a diagnostic agent. He describes focal diagnostic reactions, glands diminish after irritative swelling, Tuberculous joints show increase of size. A special reaction which is said to occur and to be of use for diagnostic purposes is what Spengler calls the tonsil reaction (Reaktions angina).

Bandelier also saw reactions in tonsils secondarily/

secondarily infected with Tuberculosis.

Sometimes you get a reaction in the shape of diarrhoea and of course also reactions in the lung focus, causing increased cough and sputum.

Roepke regards it as absolutely worthless both as a diagnostic and therapeutic agent.

Wallerstein noticed in 3 cases which were clinically free from Tuberculosis but which had an inherited tendency to it, a rise of temperature and general disturbance 2 or 3 days after a first injection of .2 cc IK. (7).

He expresses no opinion however on the diagnostic value of IK.

In one case under my own care who was suffering from Tuberculosis of the glands in the neck there appeared to be some increased swelling of the glands after IK. injection. This patient said her glands always got larger and more tender after the IK., and on one occasion two new glands appeared swollen after the IK. which were not palpable before the injection.

In one of my cases there was a doubtful reaction angina.

Schaefer[22], Roth, Simon, and Bandelier never obtained reaction angina.

F. IK. as a prophylactic agent.

I have never heard of it being used as a prophylactic against Tuberculosis in healthy individuals, but/

but theoretically it should be capable of being used in this way.

If it were capable of this it would certainly be wise to inject the contacts of Tuberculous cases. If such were done and found to cause immunity in contacts it would of course depend upon a passive immunity.

XI. COMBINATION OF IK. WITH OTHER TREATMENTS:-

During the treatment with IK. it is necessary of course to combine it with other methods of treatment.

The patient if suitable for Sanatorium treatment should have the benefit of Sanatorium régime, fresh air, good food, and medicinal measures when required.

I should think IK. might be useful to counteract an auto-inoculation causing toxic symptoms when the patient has experienced such by rather more vigorous exercise than he was capable of enduring when treatment with graduated labour is adopted. I have not seen any record of such a method of use of I.K. IK. however when given as relieving injections performs this function. It arrests an autoinoculation due to focal reaction and lytic reaction in this instance.

I.K. has been used in combination with treatment by artificial Pneumothorax. This has been recommended by Dr Med. H. Brauns[23], Hanover. In an article on this subject in the Zeitschrift für Tuberkulose 1910, he advises the simultaneous use of IK. and artificial Pneumothorax./

Pneumothorax. By Spengler's rapid precipitation method he was able to show an increase in the Immune substances in the blood after each insufflation of nitrogen into the pleural sac. He neutralises the toxins before and after the operation by means of IK. injections. In this way he attained local effects on the Tuberculous lesion by the pneumothorax and good effects on the general toxaemia by the antitoxic effect of the I.K. He relates a case of bilateral Phthisis and extensive swelling of the larynx. Within 2-3 months under continuous IK. injections the larynx was cured. The left pneumo-thorax remained complete. There were only traces of catarrh in the Right lung and the patient improved very much.

It occurred also to myself that IK. could be combined in treatment with injections of Tuberculin. I shall describe later the effect of such treatment when I come to describe the cases personally treated by IK. under my own care. I found however on looking up the literature regarding IK. that IK. had already been used combined with Tuberculin. Griffith's[24] used IK. combined with P.T.O. in one case and combined with P.T. in another case. In both instances the cases were severe, with complications, in the former gastric complications, in the latter advanced disease of the larynx. Both showed absolutely astonishing improvement under treatment. Griffiths had the impression that the IK. diminished the tendency of the Tuberculin/

Tuberculin to cause reactions.

Mitulescu[25] used IK. in conjunction with Beranack's Tuberculin, Von Ruck's Tuberculin and Haentjen's Filtrase.

In using this combined treatment I give the IK. and the Tuberculin at the same time and into the same arm, but in two separate injections instead of one, for two reasons. Firstly the IK. if mixed in the syringe with the Tuberculin might have a lytic effect on the Tuberculin and render it too toxic. Secondly if a local reaction occurred it would be impossible to say how much of it was due to the Tuberculin and how much due to the IK. I inject the IK. into a spot 3 inches or so higher than the Tuberculin. In this way, should a double local reaction occur, they will not fuse into one another. If the patient objects to the double needle prick one can give the Tuberculin subcutaneously and the IK. percutaneously by inunction.

Spengler advises in all cases where the heart is weak and signs of deficient compensation that the IK. treatment be preceded and combined with Digitalis medication. Dr Porter[26] of Chicago who used IK. in cases of joint Tubercle recommends the use of Tinct. Strophanthus or Tinct. of Digitalis in all cases which are under IK. treatment. He is opposed to the rapid method of dosage.

XII./

XII. EFFECTS OF I.K.:-

The effects of IK. may be divided into three like Tuberculin.

1. Local reaction at the site of injection.
2. General febrile reaction.
3. Focal reaction (at site of the disease).

1. Local reaction:-

The local reaction consists of redness, inflammation and swelling. The site of injection is also often tender to touch. The extent of the reaction varies. It may be confined to the needle-track or it may involve a circular area of 3 or 4 inches in diameter. In the latter case where the local reaction is severe there is often considerable oedema and considerable interference with the use of the arm. The local reaction often comes on when the injection is made in the afternoon on the same night or it may come on the next day. The reaction may last only a few hours or it may still be evident a week or even a fortnight afterwards. Its appearance a week after the injection is as an area of purplish swelling, subcutaneous thickening without much tenderness. In fact it closely resembles the reactions locally produced by Tuberculin injection. Local reactions to IK. are not common in my experience. Roepke and Bandelier assert that in the treatment of 250 cases they never once saw local reactions

reactions occur. Simon found that local redness was frequent but local swelling relatively rare and never so much as with Tuberculin. He never observed Spengler's reaction angina. Kirschenblatt[27] rarely observed local redness at the site of injection and swelling as a rule was absent. There was frequent local redness and pain in Brauer's cases. Roepke asserts however in an article written by him that after repeated arm injections he sometimes got redness and swelling. Wallerstein in a series of cases never saw local reactions.

2. General and febrile reactions:-

This is also known by the name of lytic reaction. It is due to the lysis of the bacilli in the focus of disease and the liberation of endo-toxins. In all probability therefore a general reaction is a result of a focal reaction. The symptoms are those of a Tuberculous autoinoculation-headache, malaise, tiredness, loss of appetite, pains in chest, increased cough, increased sputum and diminished power of agglutination and precipitation of the blood. There is a corresponding rise in temperature and pulse. Temperature may rise to 99-103° F and it may remain raised 1 - 3 or 4 days.

These lytic reactions occur where the antitoxic element in the dose in insufficient in amount to prevent the occurrence of the toxaemia due to the lysis. If they do not pass off in 8 days of their own/

own accord they must be cut short by a relieving injection. Armstrong[28] considers that general reaction usually occurs about the fourth day after injection. I am inclined to think that it often occurs within 24 hours.

It is often difficult to be sure whether a rise in temperature is due to a lytic reaction or due to a relapse of the disease owing to the previous dose being too small. We may get some means of distinguishing which it is by examining the sputum. Where[28] lysis has occurred the T.B. bacilli show degenerate forms. It is also possible to mistake fever due to an intercurrent disease as a lytic fever.

The value of an occasional lytic reaction is similar to the value of an occasional Tuberculin reaction or autoinoculation and is dependent upon the ultimate immunising response or active immunity. At the same time the lysis destroys the bacilli.

Wallerstein rarely saw a case in which the fever did not tend to fall after the first injection. This was followed as a rule by rise of temperature on the fifth or sixth day after the first injection, lytic reaction. Then the temperature as regularly sank again after 7 or 8 days. After the second, third, fourth and fifth injections there was a slight rise of temperature on the day following or the second day following injection. Often strong lytic reaction occurred/

occurred after the third or fifth injection. He found that the lytic reactions usually lasted 3 - 5 days.

Kerlé considered temperature variations were rarely due to the IK., but as a rule due to intercurrent disease.

Hollós found that IK. could cause an increase in the general intoxication due to Tuberculous conditions in whatever form the intoxication might show itself. Patients with constipation or gastric troubles as toxic symptoms due to Tuberculosis had such aggravated by IK. lysis. If the toxaemia due to Tuberculosis showed itself in the form of headache or sleeplessness for example, lytic action increased such symptoms and so on. He found however that the increased intoxication due to the IK. could always be removed by relieving injections in whatever form the toxic symptoms showed themselves. Roepke never saw severe general reactions with IK.

Krafft had such severe reactions with IK. that he condemned its use.

Lukin considered the occurrence of slight febrile reactions advisable.

3. Focal reaction:-

This occurs at the site of the disease. In Pulmonary Tuberculosis there is an increase in the number of moist sounds or an alteration in the quality of breath/

breath sounds at the focus of disease in the lungs. There may be the appearance of fresh creps. This causes the increase in cough and sputum, an increase in the number of bacilli in the sputum, and also presence of degenerate forms of bacilli, "splitter bodies". This ought to be succeeded by a corresponding improvement in the physical signs. In disease of the intestines diarrhoea may occur, in laryngeal disease redness and swelling of the foci there.

Roepke denies any change in focal signs either in the laryngeal picture or in the physical signs in the lungs.

XIII. CLINICAL EFFECTS OF I.K.:-

According to its originator the effects are astonishingly beneficent. There is an increase in weight, improved appetite, diminished cough, lessening of the amount of sputum, a toxic rapid pulse becomes slow and atoxic, the temperature falls and if the temperature previously was hectic it becomes an aseptic type of temperature. Defervescence occurs in many severe hopeless cases and in a surprisingly short time. One of the most beneficial effects is the rapid diminution of the number of Tubercle bacilli in the sputum. In 8 - 14 days often they are found only in isolated numbers when to start with they were present in large numbers. Sometimes the bacilli

show what Spengler calls a "pendulous disappearance". After the first few injections the bacilli may increase in numbers for the time being, then diminish and then again increase with an ultimate gradual complete disappearance. These beneficial results are said to occur not infrequently after the first injections. Such brilliant results in advanced cases where one feels powerless to be of any assistance to the patient was sufficient incentive to make one anxious to try the effect of IK. in one's own experience.

Sometimes the clinical effects of IK. are at the commencement to make the patient appear worse, but Spengler insists that in such cases the IK. should not be withheld. It is due to lytic action and will be overcome by the cumulative antitoxic effect of further doses of IK. or by relieving doses.

What is regarded as a special effect of IK. injections is the appearance in the sputum of degenerated forms of bacilli or splitter bodies. These are best seen by staining with Spengler's Picric Acid method. Their presence is regarded as an omen of good prognosis. Roepke in his series of cases under IK. asserts that such degenerate forms did not appear in the sputum in any greater number than is usually seen in cases not under IK. This effect of IK. is also seen well in sputum stained by what is called the "Structural" method. It is a modification of the/

the Picric Acid method:-

The film is stained by the Picric method already described and then without drying is subjected to the following additional processes:-

1. Flood the slide with the following solution:-

Potassium Iodide - 1.25 grams.
Iodine - 2.5 grams.
Alcohol 80% - 100 c.c.

Allow to remain on for 20-30 seconds.

2. Pour off excess of this solution and immediately, without drying, treat the slide with ½ to 1% osmic acid vapour for 10 - 15 seconds.

3. Wash at once in running water for 3 - 5 minutes.

4. Dry with blotting-paper.

This method shows the Tubercle bacillus to consist as a rule of two parts, a sheath staining red and one or several granules staining black. These granules are embedded in the sheath which seems to hold them together as peas in a pod. These granules are the splitter bodies. During lysis as the result of IK. the lysins first attack the sheaths. The sheath becomes attenuated and loses its staining power so that the granules instead of being deeply embedded in the substance of the sheath appear to be held together by delicate filaments staining fairly pink. As lysis proceeds the sheath disappears entirely. The granules then fall apart and appear as isolated splitter./

splitter. This represents the final destruction of the bacilli and is evidence of high resistance on the part of the patient; hence its value in prognosis.

This process is also described by Kirchenstein[29] thus. He regards it as a twofold process due firstly to agglutination and then lysis. Firstly the bacilli are agglutinated or heaped up. The capsule masses gradually disappear in the peripheral layers of these heaped bacilli, the capsules are first injured, then more or less destroyed and splitter bacilli appear. The whole mass becomes a conglomerate of splitter-bodies which is ultimately destroyed if enough lysin be present. He says that under IK. therapy probably agglutination becomes less, giving place to stronger lysis. This is seen in the sputum. At first there are a large number of agglutinated bacilli and in such cases the clinical temperature varies from 37.2 - 36.2 c. Then after 4 months IK. treatment agglutinated bacilli disappear to give place to splitter bodies in the sputum and then no splitter bodies or bacilli at all. This appearance of the splitter granules in the sputum is accompanied by a fall in the temperature clinically. It remains down, the temperature maximum being 36.5 C. Probably such splitter bodies can produce less toxaemia than the bacilli. Dold has shown that cholera granules cannot cause anaphylaxis. The more marked the destruction/

destruction and breaking down of the bacilli as seen in the sputum by the presence of splitter granules, the greater the clinical resistance of the patient, and the more hopeful the prognosis. It is also known that white blood cells phagocytose more readily intact bacilli than splitter or broken bacilli.

Kirchenstein has made a series of graphic curves showing how the greater the number of bacilli ingested by the leucocytes, the smaller becomes the number of leucocytes left capable of phagocytosis. The greater the number of ingested T.B. the less the toxic symptoms. Curve of phagocytosis rises highest at commencement of the treatment, then sways, rises during the complete destruction of the bacilli and falls when only splitter are present. Splitter are therefore less appetising to the phagocytes than intact bacilli. These results agree with those of Chiarolanza who found the opsonic index rise under IK. treatment.

XIV. METHODS OF CONTROL OF EFFECTS OF IK.:-

a. Clinical results:- Weight, pulse, temperature, sputum, subjective symptoms, physical signs, etc.

The weight should be taken once a week at the same time on each occasion and the patient wearing the same clothes. Such is sometimes impossible in dispensary practice. The weight of course ought to increase./

increase. Various observers have noted an increase in weight under IK.

Temperature. This should be taken 4 hourly. In dispensary practice, especially, if the patient is at work during treatment, it is almost out of the question to get the temperature taken regularly 4 hourly over a long period. In some cases however we can get the patient to take the temperature every 4 hours for 48 hours immediately following the day of the injection and occasionally at other times. As a rule however in ambulant practice the temperature can only be got twice daily, in the morning on getting up and at 5.30 p.m. If the patient is working it often cannot be taken till 8.30 p.m. when the daily work has been finished for some time. The temperature may be taken in the mouth, in the axilla or per rectum. The patient must of course adhere to one method. The patient is warned not to take the temperature immediately after exercise. In ambulant dispensary practice the dispensary nurse must teach the patient the method of taking and charting temperature. Under IK. therapy properly controlled with proper dosage the temperature should improve. Various authors have observed defervescence under IK. Where defervescence occurs the injection should not be continued until the temperature begins to rise again, or until it has remained down for some time[28].

Pulse./

Pulse. This ought to be taken twice a day. In dispensary practice it can of course only be taken at the weekly or twice weekly visit to the dispensary. A pulse of over 120 per minute is a contraindication to the use of Tuberculin as indicating too severe a toxaemia for active immunisation treatment. With IK. this is not a contraindication but more an indication for its use. The main object in controlling the pulse in IK. besides its value as an index of toxaemia depends on its value as an index of the state of the heart. The cardiac tone must be maintained under IK. Irregularity or feebleness of the pulse indicate the need for Digitalis or Strophanthus. The state of the heart must always be examined before commencing IK., position and quality of apex beat, and presence or absence of organic bruits. Under IK. a rapid pulse should become one of normal rate.

Subjective symptoms. Apart from lytic reactions these should be bettered, appetite improved, pain less, vigour increased. If the subjective state is worse the dosage is wrong. Too severe lysis is being maintained in the absence of antitoxic resistence.

Sputum. This ought to be measured every 24 hours and a curve of its amount daily charted. For obvious reasons in dispensary cases this cannot be done. One has to rely on the statement and common sense/

sense of the patient. The sputum should diminish rapidly and also become less nummular. The number of Tubercle bacilli should also get less as I have already mentioned.

Herzberg noticed rapid disappearance of the T.B. in the sputum[30].

Hollós in one case noticed the T.B. in the sputum fall from Gaffky 10 to Gaffky 3.

Kirschenblatt observed degenerative changes in the bacilli as the result of IK. treatment, so also did Armstrong in his cases.

Woolston found the bacilli diminish in numbers[31].

Alexander[32] and Roepke observed no effect on the number of bacilli.

The number of bacilli are estimated either according to Gaffky's scale or Spengler's scale.

Spengler's scale:-

0-1. In whole preparation only isolated bacilli.

1. In isolated fields a few bacilli.

1-2. Less than 12 bacilli in each field.

2. About 12 bacilli in each field.

2-3. More than 12 bacilli in each field and still countable.

3. In greater amount and no longer countable. As in pure culture.

Gaffky's scale:-

1. In whole preparation only 1-4 bacilli.

2. Average of several fields 1 bacillus.

3. In each field 1 bacillus.
4. In each field 2-3 bacilli.
5. In each field 4-6 bacilli.
6. In each field 7-12 bacilli.
7. In each field fairly numerous.
8. In each field numerous.
9. In each field very numerous.
10. In each field enormous number.

Objective signs:-

The crepitations should diminish in numbers and improve in quality. The area of consolidation should get less and the usual signs of a healed focus alone remain.

b. Special precipitation tests of blood:- An increase in the power of the patient's blood in Tuberculosis to precipitate the Tubercle toxins is usually associated with an increased clinical resistance. A decrease in the specific precipitins is united with a lowered clinical resistance. But besides investigation of the specific precipitins one must investigate the auto-precipitins. Auto-precipitation is the precipitation which occurs when blood is brought in contact with simple .5% carb. normal saline without the presence of specific antigens. It is due to the precipitation of autotoxins in the blood by antibodies also present. Autotoxins are fatigue toxins. It is most important to estimate the ratio of specific precipitation to autoprecipitation.

Frau/

Frau Sophie Fuchs-Wolfring has been the most important investigator of the question of blood-precipitation in Tuberculosis.

The amount of specific precipitins in the blood is usually regarded also as giving an estimate of the amount of other Immune Bodies in the blood. Where the precipitin value is high then as a rule there is a corresponding increase in the other antibodies, namely lysins, antitoxins, and agglutinins. The technique of the test is simple. The materials required for the test are:-

1. 21 test tubes of clear thin glass, each about 7 cm. long by 1 cm. in diameter.
2. A glass syringe of 1 cc. capacity graduated in 10ths.
3. Red, blue, and yellow glass writing pencils.
4. Diluting fluid - .5% carbolic in .5% normal saline.
5. 3 small wooden stands or cardboard stands to hold the test tubes in an upright position.
6. A small glass measure of 2 cc capacity graduated in 10ths of a cc for receiving the blood to be tested.
7. A filtered test solution of human Tubercle bacilli.
8. A filtered test solution of bovine Tubercle bacilli.

These are prepared by weighing out 1 gram of the dried and killed bacilli and grinding them up with a mortar/

mortar and pestle, then making a homogeneous emulsion with 200 cc glycerine and 800 cc diluent. The solution is filtered and secured in well-stoppered bottles.

Method of performing the test:-

The test tubes are divided into 3 rows of 7 in each row and put upright in their stand. They are numbered from 1 to 7 in each row. The 7th tube in each row is marked with a ring.

1st Stand containing 1 set of 7 tubes is numbered in red ink.

2nd Stand containing 2nd set of 7 tubes is numbered in blue ink.

3rd Stand containing 3rd set of 7 tubes is numbered in yellow ink.

The red set is placed on the left side of the table, the blue set in the middle and the yellow set on the right.

In each of the seven red numbered tubes is placed .9 cc of human Tubercle extract.

In each of the seven blue numbered tubes is placed .9 cc of bovine Tubercle extract.

In the seven yellow numbered tubes is placed .9 cc of diluting fluid.

The thumb of the patient or the lobe of the ear is then cleaned with ether and sharply pricked with a needle. The blood is allowed to flow into a 2 cc measure previously filled to the extent of 1.8 cc with diluting fluid. Blood is added till the mixture reaches/

reaches 2 cc. The blood is then diluted in the proportion of 1 in 10. The blood must be examined with regard to the precipitin power in dilutions of 1 in 10,000 to 1 in 1,000 million.

A 1 in 1000 dilution is then made from the 10% solution by means of the 1 cc syringe.

From this 1 in 1000 dilution .1 cc is taken and placed in each of the tubes numbered 1, thus making the dilutions of blood 1 in 10,000.

.1 cc of the 1 in 1000 dilution is diluted in the glass syringe with .9 cc of the diluent, making 1 in 10,000 dilution.

.1 cc of the 1 in 10,000 is put in each of the tubes marked 2, thus making a 1 in 100,000 dilution. By repeating in this manner:-

No.3 tubes contain 1,000,000 dilution.

No.4 tubes contain 10,000,000 dilution.

No.5 tubes contain 100,000,000 dilution.

No.6 tubes contain 1000,000,000 dilution.

No blood is added to the No.7 tubes at the right end of the rows. These are control tubes.

The tubes are then collected and placed in a water-bath at 48°C. for 15 minutes. They are then taken out, carefully cleaned and dried on the outside with a soft cloth and examined for the presence or absence of precipitation. The tubes should be held upright against a dark background. The finer degrees of precipitation require practice for its recognition by/

by the observer. The red and blue tubes represent the amount of specific precipitation. The yellow tubes represent the amount of auto-precipitation.

Specific precipitins are present in the blood of all people and their respective amounts indicate the degree of immunity to the human and bovine Tubercle bacilli. In normal blood the degree of specific precipitation is always higher than the auto-precipitation except in severe exhaustion. In cases of Tuberculosis the auto-precipitation rises above specific precipitation. It is the object of IK. treatment to produce a reversal of the relationship. If the patient has Tuberculosis then under IK. treatment where the auto-precipitation was greater than the specific, the condition must be reversed. IK. should change the immune state of the patient's blood so that the specific becomes higher than the auto-precipitation.

Auto-precipitation is also described by Wolfring as the relative toxin line as its amount is an index of the degree of toxaemia. According to most observers the curves representing the degree of precipitation to T.B., P.B. and auto-precipitation vary independently of one another. The curves of the healthy and unhealthy have however definite characters independent of each other. In the healthy free from fatigue, auto-precipitation is lower than specific precipitation./

precipitation.

The results obtained by Fearis may be quoted here[33]:-

1. In healthy individuals auto-precipitation ranges from 100,000 to 1,000,000 and the specific precipitation from 1 to 10,000,000 or more.
2. In Tuberculous individuals auto-precipitation is usually higher than specific precipitation. If a patient is free from fatigue and any other serious infection, high auto-precipitation with low specific precipitation points strongly to the presence of Tuberculosis. Tuberculous cases living under good conditions with considerable power of resistance sometimes have high specific precipitation but the auto-precipitation is much higher than that of a healthy man.
3. Cases with low specific precipitation and low auto-precipitation, the former 1,000,000 and the latter 100,000, if not apparently Tuberculous will soon be so. Such cases should have treatment at once.
4. The worst types of Tuberculous cases have a mean specific precipitation of 10,000 and auto-precipitation of 100,000.
5. Tuberculous cases under Tuberculin have a mean specific precipitation of 800,000, and auto-precipitation 200,000.
6. Tuberculous cases under IK, specific precipitation averaged 8,000,000 and auto-precipitation 5,000,000.

In/

In taking the sample of blood one must avoid errors due to fatigue. In this connection the results of the experiment of Frau Sophie Fuchs-Wolfring[34] are of great interest. She represents the degree of specific precipitation and auto-precipitation by columns. The dark columns represent the specific precipitation and the shadowed columns represent auto-precipitation.

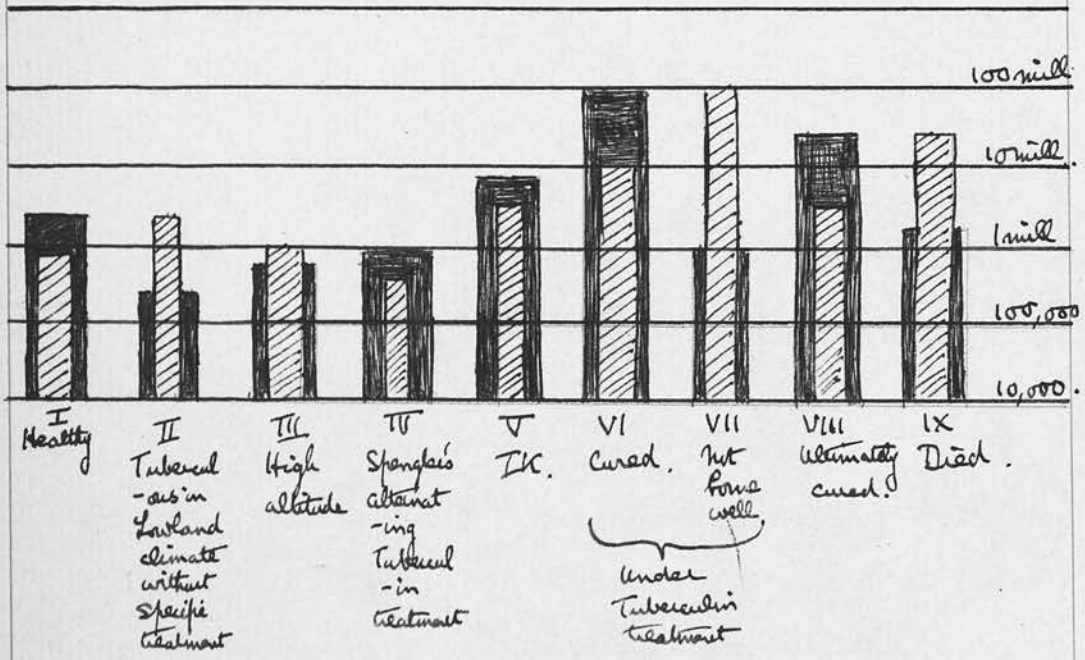


Figure 1 shows the average precipitation height in a healthy man. Specific in healthy therefore lies between 1 in 1,000,000 and 10,000,000 while auto-precipitation remains under 1,000,000.

Figure 2 shows average height of precipitation in Tuberculous not under specific treatment. Here we see a reversal - auto-precipitation higher than specific precipitation.

One therefore regards these columns as typical. Treatment/

Treatment is therefore only successful when we change a case of type 2 into that of type 1. All conditions causing type 1 to become type 2 must be injurious. That this is in fact the case we have shown by numerous tests. Figures 3,4,5, show the precipitation value of Tuberculous under the influence of different treatments, (a) High mountain climates alone; (b) Spengler's vaccination treatment in high climate; (c) IK. treatment in high climates.

Figure 3 (Tuberculosis in high mountains) shows a very slight rise of the specific precipitation and a definite fall in the auto-precipitation. Still the high climate alone does not bring the auto-precipitation below the specific. This agrees with the clinical experience that only cases with favourable prognosis are cured or improved in high altitudes.

Figure 4. represents the average height of precipitation in the Tuberculous who were treated with Tuberculin (Spengler's vaccination method, alternating Tuberculin). The specific column is higher, goes up to 1,000,000, the toxin line is already depressed below the antibody line meaning favourable influence on the disease.

Figure 5 represents average height of precipitins of Tuberculous under the influence of IK. The precipitation value is here at its highest (1 in 10,000,000 specific, about 1 in 5,000,000 auto-precipitation). Even in severe and hopeless cases the average shows

a/

a lowering of the relative toxin line under the specific which naturally can only be due to the IK.
Figures 6,7,8,9 show clearly as by an experiment that one can indeed only expect a successful treatment when one succeeds in getting the relative toxin line, the auto-precipitation, which is higher than the specific in Tuberculous, lower than the specific. Figure 6 shows the average precipitins of persons who were cured with Tuberculin. The specific column shows up to 1 in 100,000,000 and is far above the toxic column.
Figure 7 shows the average precipitations of some cases which got worse under Tuberculin and went on to IK. Here one sees the same reversal of condition as in one and two.
Figure 8 is the average of 50 tests in IK. patients who are known to be carrying on their calling in perfect health and show great improvement. Here one also sees the typical elevation of the specific columns.
Figure 9 is the average of 50 tests of IK. patients who in further course died. These columns show the ominous reversal characteristic of Tuberculosis unaffected by treatment. The rise of specific precipitation can in itself be of little use when it does not succeed in lowering the auto-precipitation and thereby equalise the deficit.
Figure 10 shows precipitins of a healthy man.

Figure/

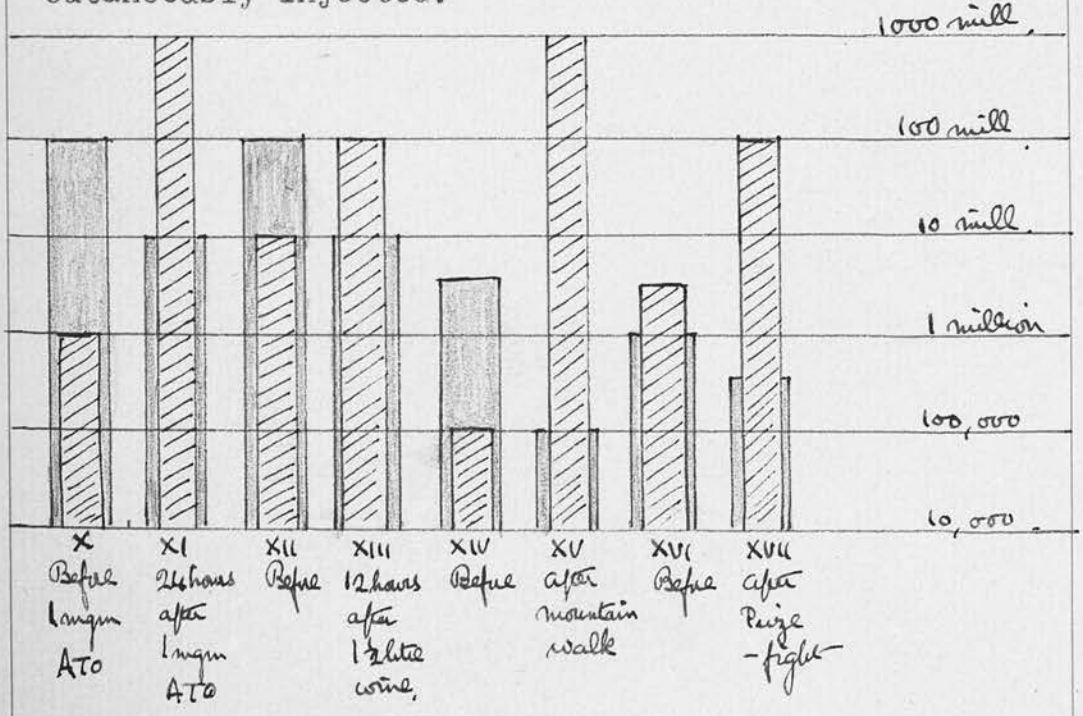
Figure 11 shows precipitins of the same 24 hours after a dose of Tuberculin.

Figures 12 and 13 show the precipitation of a healthy man before and 12 hours after an excess of alcohol (1½ litres of wine).

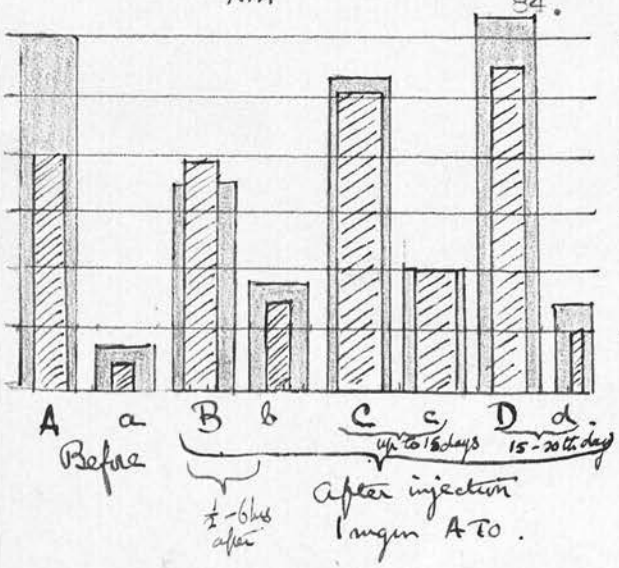
Figures 14 and 15 show the blood values of a healthy man before and after a walk on the mountains.

Figures 16 and 17 show the precipitins of a professional boxer before and after a fight. These 8 columns show how the toxins and fatigue lower the specific precipitation against Tuberculosis and raise the relative toxin line.

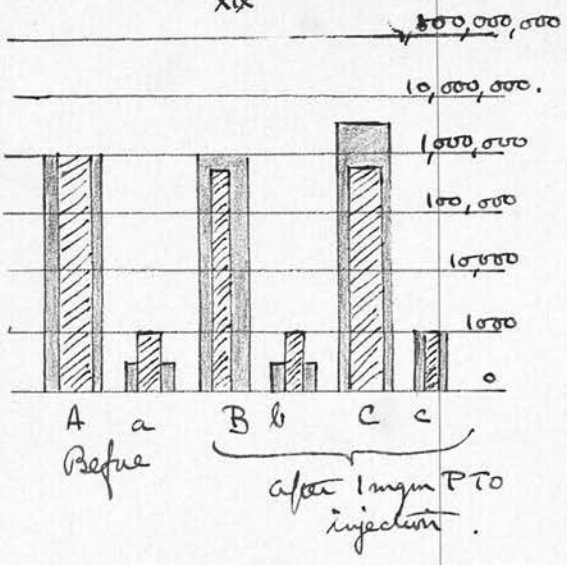
Figure 18 shows how the organism protects itself. One shows here the average of a series of investigations of a healthy man in whom 1 mg. A.T.O. was subcutaneously injected.



XVIII



XIX



A.a shows the precipitin content of the blood cells and of the serum before injection.

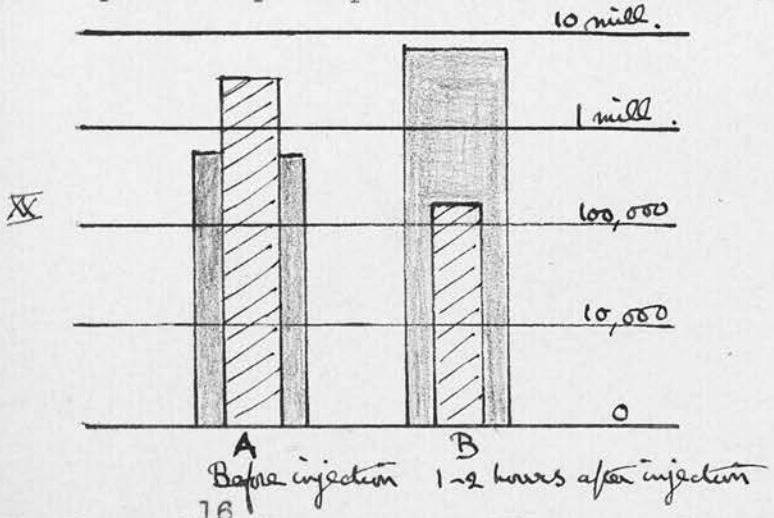
B.b shows the precipitin content of blood cells and serum on day of injection (average of observations - ½, 1, 2, 3, 6 hours after it). One sees how a diminution in the precipitins of the blood cells was accompanied by an increase of those of the serum. In the cells the specific falls below the relative toxin line while the precipitins of the serum are increased. Serum shows haemolysis.

Figure C.c shows how the blood cells in the first 15 days gradually rise again. The blood cells succeed in regenerating their specific precipitins. Between the 15th and 20th day one finds an over-production so that the specific precipitins exceed their previous amount and are above the auto-precipitins. The immune bodies in the cells act as a reserve fund against infection. If these are drawn upon to resist infection, for recovery there must follow an over-production. In this way a person may resist Tuberculosis - apparently -/

apparently - and yet T.B. be found Post Mortem. If no over-production follows, then there is a deficit in the reserve fund and the case gets worse. The results on the same man three months later with injection of 1 mg. P.T.O. show a less toxic effect.

This confirms the value of Spengler's vaccine methods.

Figure 20 shows the effect of a single IK. injection from an average of a series. It shows how IK. raises the specific precipitins with fall of autoprecipitins.

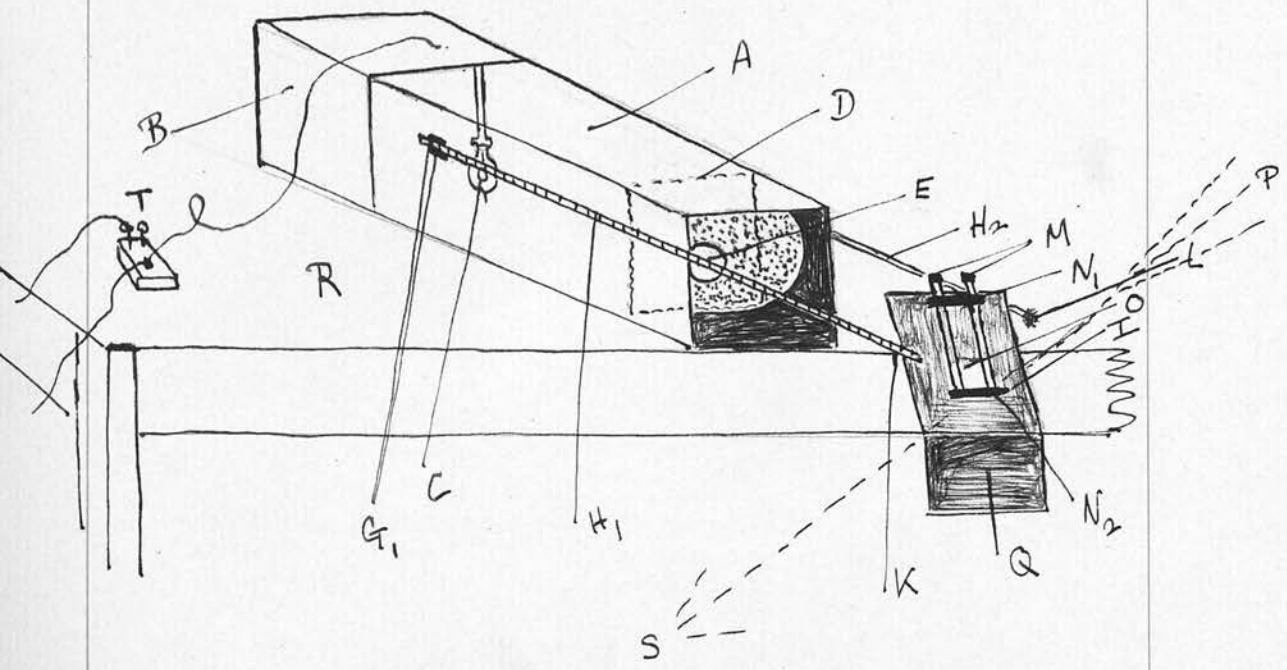


Dr Eversole[16] who got excellent results with IK. in a series of cases of Tuberculosis of the bones and joints found that an estimation of the precipitin content in this manner was of great value in estimating the dose of IK. required and also in that way of preventing undue reactions.

Armstrong also recommends the use of these tests as a guide in the treatment with IK.

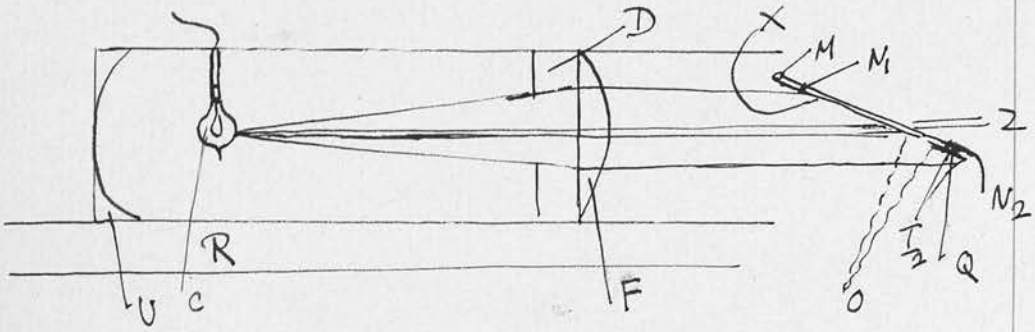
Fearis has devised a special apparatus for the better definition of the finest precipitation in the tubes, superior to the use of the naked eye.

Fig I



In figure 1 is shown a general plan of the apparatus. A. is a box 12 x 12 x 17.6 cms. It is dead black inside. B is the lamp-holder,- an oblong box fitting on to A. A small filament electric lamp c is mounted in the focus of a paraboloid mirror (U in fig. 2). D is a black metal diaphragm with a circular aperture E. It is convenient to have a means of regulating the size of E - a diaphragm may be inserted in front of the lens F. F. is a plano - convex - condensing lens mounted so that the lamp is approximately at the focus of the lens and in the principal axis. The convex surface faces outwards. G are 2 guides. There is a similar pair of guides on the other/

other side of the box. H_1 H_2 are 2 struts which slide through the guides G_1 and G_2. K is a clamping screw. L is a dial showing the angle at which I is set. M are 2 test tubes containing the solutions to be compared. N_1 N_2 are 2 grooved guides holding the test tubes accurately so that there is a small space between them. N_2 just covers the foot of the test tubes. N_1 N_2 are dead black. O is a window, 2 x 1.5 cms. This just allows light to pass through the column of liquid, 1 cc in each test tube. It is exactly opposite centre of lens F. Q is a velvet screen to save the eyes from light. R is a table. Space S under the table should be dark. T is a switch. The dotted arrow shows the line of sight of observer. Distance of holder I from front of the box is 11 cms. Holder I set at angle of 40°.



Method of use of the apparatus:-

Test should be carried out in a dark room illuminated by a lamp which can readily be switched off and on. The apparatus is placed so that the front of the box A is on the edge of the table. The observer is seated/

seated on a chair placed in front of the apparatus so that the eyes are about 30 cms. from the window O and well above the level of it, so that no direct light may fall on the eyes.

A black velvet cloth is placed on the apparatus so as to prevent the escape of light between the front of the box A and the holder I. It should just leave the window O open.

Supposing T.B. precipitation is to be determined. After the 7 tubes have been treated as described in the rapid precipitation test they are polished. Those showing obvious precipitation after recording are put to one side. The control tube 7 containing the test solution alone is placed in the holder and in turn each of the other tubes is compared with it, lamp c being switched on. Sometimes one tube may appear slightly more opalescent than the control, but on reversing the positions of the tubes it may no longer appear so. To prove definite precipitation the opalescent tube must pass this "reversal test".

Other investigators in the use of IK. do not seem to have used these tests in their treatment, but have relied on general clinical data in the same way as one may use Tuberculin without resorting to the labour of carrying out the opsonin test before and after each dose of Tuberculin.

For diagnostic purposes the specific and auto-precipitation/

precipitation test is obviously also valuable.

c. Arneth count:-

This of course can be used as a guide in the treatment with IK. Arneth divides the neutrophile leucocytes into 5 classes:-

Class I. Neutrophile polynuclear leucocytes containing one nucleus.

a. Myelocyte.

b. Nuclei consisting of round piece (eine Kernteile).

c. Nuclei that are bent (1 Schlingen).

Class II. Neutrophile polynuclear leucocytes with 2 nuclei.

a. Nuclei with 2 round pieces (2 K)

b. Nuclei with 2 bent pieces (2 S)

c. Nuclei with one round piece and one bent piece (1 K and 1 S)

Class III. Neutrophile polynuclear leucocytes with 3 nuclei.

a. Nuclei with 3 round pieces (3 K)

b. Nuclei with 3 bent pieces (3 S)

c. Nuclei with 2 round pieces and 1 bent piece (2 K and 1 S)

d. Nuclei with 2 bent and 1 round piece (I K and 2 S).

Class IV. Neutrophile polynuclear leucocytes with 4 nuclei

a. Nuclei with 4 round pieces (4 K)

b. Nuclei with 4 bent pieces (4 S)

c. Nuclei with 3 round pieces and 1 bent (3 K and 1 S).

d. Nuclei with 2 round pieces and 2 bent pieces (2 K and 2 S).

e. Nuclei with 1 round piece and 3 bent (1 K and 3 S).

Class V. Neutrophile polynuclear leucocytes with 5 nuclei.

a. Nuclei with 5 round pieces (5 K).

b. Nuclei with 5 bent pieces (5 S).

c. Nuclei with 4 round and 1 bent piece (4 K and 1 S).

d. Nuclei with 3 round and 2 bent pieces (3 K and 2 S).

e. Nuclei with 2 round and 3 bent pieces (2 K and 3 S).

f. Nuclei with 1 round and 4 bent pieces (1 K and 4 S).

The blood slide is made in the usual way, and stained with Leishmann or Giemsa. In normal blood if 100 cells are counted in this way and divided into the 5 classes, the percentage of cells in each class are:-

Class 1.	Class II.	Class III.	Class IV.	Class V.
5%	35%	41%	17%	2%

Arneth found that in certain infective diseases and also in Pulmonary Tuberculosis that if the disease was severe the number of cells in class 1 and II were increased and those in classes III, IV and V were diminished. This is what is called the "left hand drift". If the disease is improving this "Left hand drift" diminishes. Arneth's count has been found useful as a guide in treatment by Contratoxin[35] and/

and also in treatment by Tuberculin. If one is giving too toxic doses of these the "Left hand drift" increases. So also in treatment with IK. one can use the Arneth count as a guide.

d. Blood pressure.

In advanced Pulmonary Tuberculosis this is very low. As the case improves the blood pressure rises. Efficient treatment should cause a rise in general blood pressure. Dr Porter recommends the blood pressure as a guide in IK. therapy.

e. Red blood cell count.

As the Immune Bodies are formed in the red blood cells the red blood cells count should be of value. If it is low then the active immunisation by IK. is inferior.

f. Comparative agglutination and opsonic test of focal serum and general serum.

Another method of controlling the effect of specific remedies such as Tuberculin or IK. depends upon an investigation of the agglutinative and opsonic power of the serum of the sputum of the patient. Such an investigation allows one to compare the immunising power of the serum at the focus of the disease at various times with the immunity condition of the general blood stream at the same times. Although the test is an original one I have not yet had sufficient opportunity of carrying it out often enough to be

able to give the general results of such an inquiry. The test is carried out in the following way:-

1. Obtaining clinical material for test.

The patient is given a measured sputum flask on a certain day. Sputum is collected till the amount reaches the mark 1 oz.

Samples of the patient's blood are taken when the patient is given the flask in the morning, when the amount of sputum has reached 1 oz., and at an hour midway between this interval of time that the patient requires to expectorate the above amount of sputum.

The blood is obtained by pricking the patient's finger, previously washed clean with ether, and is collected in Wright's capsules (sterile).

2. Laboratory preparations of various components required for test.

a. Sputum as obtained above was added to a Berkfeld laboratory filter and filtered into the flask of the filter which was along with the filtering cylinder previously rendered sterile by boiling. In this way the serum of the sputum was filtered through sterile. About 2 drachms of sputum serum were thus obtained.

b. Emulsion of ground down dead Tubercle bacilli was then made. Dead bacilli for this purpose were obtained, 1 gr. in each bottle. .02 gm. being taken, it/

it is added to a sterile glass mortar and sterile .5% carbolic in normal saline added in the proportion of 1-10. The bacilli are then ground down with the glass pestle to form a thick milky emulsion. More .5% carbolic normal saline is then added to proportion of 1-100 and again triturated. The opaque emulsion thus formed is centrifuged so that the majority of the bacilli are sedimented. The centrifugalisation is carried out in a sterile glass centrifuge tube. More .5% carbolic normal saline is added to proportion of 1 in 10,000. The bacillary emulsion is then almost like water, only slightly opalescent.

c. The Wright's capsules containing the patient's blood is then centrifuged till the red blood cells sink to the bottom, above that a layer of white blood cells and on the surface the serum.

d. The blood of a normal person during the same period is collected in sterile Wright's capsules and the serum obtained in the same way.

e. Dilutions of sputum serum, patient's blood serum and normal blood serum are then made with normal saline in proportions of 1 to 10, 1 to 25, 1 to 100, and 1 to 200.

f. 12 sterile Wright's sedimentation tubes are then taken. Equal parts of the 4 dilutions of sputum serum, patient's blood serum, and normal blood serum are added to the same amount of bacillary emulsion./

emulsion. The 12 mixtures thus obtained are added to the sedimentation tubes.

g. The sedimentation tubes are then put in the incubator at 37° C for 6 hours.

h. At the end of 6 hours the tubes are then examined in a good light for evidence of the agglutination of the bacilli. By the maximum degree of dilution in which agglutination is obtained one can estimate and compare the agglutinative power of the serum of the patient's sputum, serum of patient's blood, and serum of normal person during the period in question.

II. Opsonic estimation.

The opsonic power of the patient's sputum serum, patient's blood serum, and normal person's serum can be investigated by performing the opsonic index test in the usual way with these three components.

By the performance of this test one should be able very accurately to decide the amount and length of focal reaction at the site of the lesion in the lungs.

XV/

XV. IK. TREATMENT COMPARED WITH OTHER METHODS OF TREATMENT.

Name of Author.	Duration of Treatment in days.	Average increase in weight.	Average increase in Weight according to stage			Average increase in Weight per 30 days.	%age of Cases with loss in weight.
			I	II	III		
German Sanatorium at Davos. Report 1910.	199	3.23 Kg.	No data			.48 Kg.	2.3
Bandelier Görbersdorf. Combined Tuberculin Sanatorium Treatment.	169	5.3 Kg.	4.54	5.8	4.12	.94 Kg.	4.2
Authors who use IK. Simon, Sanatorium, Lippspringe Test I	81	4.42 Kg.	5.06	4.6	3.62	1.63 Kg.	2.3
Test II.	77.8	5.37 Kg.	—	6.14	4.6	2.07 Kg.	5.
Kerlé. Mulrose Sanatorium	90	6.85 Kg.	6.1	8.5	6.13	2.28 Kg.	1.8
Schäfer, Sanatorium Gladbach.	60	5.82 Kg.	-	-	-	2.91 Kg.	0.
Weihrauch Sanatorium Holsterhausen.	70	5 Kg.	-	-	-	2.14 Kg.	2.

From the above table Fearis[5] shows that the average increase in weight per 30 days is much greater under IK. treatment than with Sanatorium treatment alone/

alone or with combined Tuberculin and Sanatorium treatment. The cases treated with IK. were worse cases, yet the increase in weight per 30 days was 4 times greater than with combined Tuberculin and Sanatorium treatment and twice as great as in Sanatorium treatment alone.

Table showing effects of various methods of treatment upon Tubercle Bacilli.

Author	Duration of treatment in days.	% of cases with T.B. in sputum.	% of cases which lost T.B.	% of Stage II cases which lost T.B.	Average time to free Stage II Cases from T.B.	% Stage III cases which lost T.B	Average time Stage III cases to free from T.B.
German Sanatorium at Davos. Report 1910	199.	58.	23.7	32.5	-.	14.2	-.
Bandelier Görbersdorf. Combined Tuberculin and Sanatorium treatment.	169.	40.4	63.9	87.3	Not 1 case lost TB in less than 100 days	44.2	-.
Authors who used IK. Simon. Test II.	77.8	72.5	34.5	66.6	52.1	20.	60.
Kerlé.	90.	83.	37.	100.	25.	22.	-.
Schäfer.	60	100.	28.5	-.	-.	-.	-.
Benöhr and Hoffmann.	127.	87.7	71.05	87.9	-.	53.	-.

From the latter table it is seen that 66.6% of Simon's Stage II cases were freed from TB. in an average time of 52.1 days and 100% of Kerlé's Stage II cases were freed from TB. in 25 days. Not one of Bandelier's cases lost their TB. under 100 days.

In the cases of Benöhr and Hoffmann[36] where the percentage of bad cases was high and where many had undergone previous treatments with no result 71% of these cases after IK. treatment lasting 127 days, became free of TB. in the sputum. Bandelier's results showed only 63.9% of his cases free from TB. in the sputum after treatment lasting on an average 169 days.

Thus with much worse cases IK. gave better results than combined Tuberculin and Sanatorium treatmand and in three-fourths of the time.

Simon, Schäfer, and Kerlé also got better results than Bandelier and their cases were of a more advanced type.

One can at this point also, for the purposes of comparison, repeat the immunity results obtained by precipitation tests under the various methods of treatment.

Average/

	Average Immunity.
Tuberculous case of bad types which usually die.	10,000
Tuberculous cases under Open Air treatment at a low altitude.	100,000
Same but at a high altitude.	110,000
Tuberculous cases, Spengler's alternating Treatment.	800,000
Tuberculous cases under IK. treatment.	8,000,000
Healthy persons.	5,000,000

IK. raises the immunity value above normal even.

XVI. SUMMARISED ACCOUNT OF 41 CASES OF TUBERCULOSIS TREATED BY THE AUTHOR WITH IK.

A. Rapid Method.

1. Douglas Emery - age 6 - Scholar.

History:-

No constitutional symptoms - No history of Tuberculosis.

Symptoms and physical signs:-

Prolonged expiration and slight dullness at R. apex. No signs of enlarged Tuberculous bronchial glands.

Diagnosis:-

Early case - Turbin I - Philip 1$_1$s

Treatment:-

5 inunctions:- IK (4) .02 - IK (orig.) .02 cc - increased 10-fold each time.

Result of treatment:-/

Result of treatment:-

1. Reactions	None.
2. General condition	Improved.
3. Weight	In statu quo.
4. Temperature	Unaffected.
5. Physical signs	In statu quo.

IK produced no appreciable effect on the disease.

II. Olive Plummer - S - Scholar.

History:-

Duration 2 years - frequent colds and haemoptysis.

Symptoms and physical signs on admission:-

Pains in chest - night-sweats - dyspnoea. Dullness - Prolonged expiration at R. apex -Broncho-vesicular breathing, rhonchi and vocal resonance at R. inter-scapular area.

Diagnosis:-

Hilum Pulmonary Tuberculosis.

Treatment:-

Commenced with cod-liver-oil and malt and continued with Parrish's Food and Guaicose.

Under this treatment weight increased from 22.8 Kgs. to 26.8 Kgs.

Started inunctions at end of 3 months with IK .0002 cc, .002 cc - .02 cc - .04 cc.

Felt poorly, feverish, pain in the chest after dose .04 cc, but no evidence of local or focal reactions.

Next dose relieving inunction, .004 cc, .006, .01 cc/

.01 cc felt ill.

Continued with .005 cc (relieving inunction) - .01 cc - .02 cc - .015 cc.

Series:- .0002 cc, .002 cc, .02 cc, .04 cc, .004 cc, .006 cc, .01 cc, .005 cc, .01 cc, .02 cc, .015 cc.

Total:- 11 inunctions (including 2 relieving doses.

Result of treatment:-

1. Reactions	No definite reaction, temperature 100.2 one day following IK .04 cc? Febrile reaction.
2. General condition	Improved.
3. Weight.	Diminished from 26.8 Kgs. to 25.7 K.
4. Temperature	No effect on temperature.
5. Physical signs	In statu quo.

IK produced no appreciable effect.

III. Fred. Henry Bishop - Age 2 years 3 months.

History:-

Sent in as Tuberculous - History of bronchitis.

Symptoms and physical signs:-

Night-sweats. Creps at R. base anterior.

Diagnosis:-

Doubtful. Von Pirquet test negative. Rickets and Bronchitis. ?Pulmonary Tuberculosis.

Treatment:- /

Treatment:-

Cod-liver-oil and malt and IK. inunctions:-

Series:-

(6).02,(5).02,(4).02,(3).02,(2).02,(1).02,(Orig.).02.

Total:- 7 inunctions.

Result of treatment:-

1. Reactions.	None.
2. General conditions	Improved very much.
3. Weight.	Increased from 11.1 K. - 12.05 Kgs.
4. Temperature	No change.
5. Physical signs	Great improvement - chest clear.

IK had probably no effect on the disease and the good result was due to general treatment.

IV. Francis Wm. Day. Age 7 years and 3 months.

History:-

Diarrhoea 3 or 4 times a day since infancy. Had bronchitis at age of 3 months.

Symptoms and physical signs:-

Diarrhoea and shouts in his sleep. Tonsils plus - no abdominal tenderness - no glands felt in abdomen - Von Pirquet test plus - Eustace Smith sign positive - small glands in neck.

Diagnosis:-

Mucous disease or Tuberculous Enteritis.

Treatment:-

Stopped sugar in diet and put on Rhubarb and Soda/

Soda mixture.

Motions less at once - only once a day.

Commenced IK inunctions after a month's observation.

Series:- IK (5) .1, IK (3) .01, .05, (6) .02, (5) .02, (4) .02, (3) .02, (2) .02, (1) .02, .06, .08, (orig) .01, .03.

Total:- 13 inunctions.

Result of IK treatment:-

1. Reactions	Rise of temperature to 99.4 or so after 8 out of the 13 inunctions.
2. General condition	Improved.
3. Weight	Increased from 22.3 K. to 23.5 K.
4. Temperature	Slightly raised.
5. Physical signs	Improved.

IK had no appreciable effect on the disease.

V. William J. Lobb - age 30 - Coachman.

History:-

Started with a cold 14 months previously.

Symptoms and physical signs:-

Cough, expectoration and haemoptysis.

Creps left apex posterior, to spine of scapula, anterior, creps left side here and there. Bronchial breathing right side anterior.

Diagnosis:-

Chronic Pulmonary Tuberculosis.

Treatment:-

Had general treatment, including cod-liver-oil and/

and malt, cough medicine and chemical food, for 2 - 3 months.

Objected to injections.

Commenced IK inunctions. Physical signs then:-

Creps left interscapular area and left base anterior.

Series:-

IK.000,01,.0001,.0001,.001,.0001,.001,.01,.02, .03,.04,.05,.06,.08,.008,.01.

Total:- 15 inunctions.

Result of treatment:-

1. Reactions	None.
2. General condition	Unaltered.
3. Weight	Fell from 9 St. 1½ lbs. to 8 St. 11 lbs. 4 oz.
4. Temperature	Unaltered.
5. Physical signs	In statu quo.

IK had no appreciable effect on the disease.

B. Gradual Method.

VI. William Osment - age 8 years 4 months - Scholar.

History:-

Night-sweats, tiredness, pain in abdomen.

Symptoms and physical signs:-

Slight cough, severe night-sweats, cyanosed appearance.

Apex beat in nipple line.

a. Bronchial glands:- Distended veins. Eustace Smith sign plus.

b. Lungs:- Creps and dullness whole of left lung.

Vocal/

Vocal resonance plus, occasional crep at right base and right interscapular area.

Diagnosis:-

Chronic Pulmonary Tuberculosis.

Treatment:-

Inunctions of IK, cod-liver-oil and malt, and chest rubbed with rubbing oil.

Inunction series:- IK (5) .05 cc, .08, (4), .04, .08, (3).01,.05,(2).01,(1).01 - Total 8 doses.

Result of treatment:-

1. Reactions	Doubtful febrile reaction after IK (4).04 cc. After the dose .08 pimples appeared at site of inunction.
2. General condition	In statu quo.
3. Weight	Increased from 21.3 K. to 22.3 K.
4. Temperature	No effect on temperature.
5. Physical signs	In statu quo.

IK had no appreciable effect on the disease.

VII. Aaron Charles Parker - age 8 yrs. 3 months - Scholar.

History:-

Cough since bronchitis 2 years ago. Vomited blood 2 years ago. Night-sweats and pains in abdomen sometimes. Father died of Pulmonary Tuberculosis and also grandmother.

Symptoms and physical signs on admission:-

Creps and rhonchi at right base anterior but from moist sound of the cough one would think there/

there would be more disease. No physical signs of Tuberculosis of bronchial glands.

Diagnosis:-

Chronic Pulmonary Tuberculosis.

Treatment:-

a. General:- Oil and malt, rubbing oil, and cough mixture.

b. IK inunctions.

Inunction series:- IK (4) .1,(3).04,.06,.08,(2) .01,(3).02,.04,.08,(2).01,.02(3).02,(2).02,.06,(1) .01. Total 14 Inunctions.

Result of IK treatment:-

1. Reactions	2 febrile reactions, temperature 100 F. one night after dose IK (3).04, temp.100.8 F. 3 days after. Temp. 100.2 2 days after IK (2).01. Both rises of temperature accompanied by focal increase in creps. Doubtful if these changes due to IK.
2. General condition.	Unaltered.
3. Weight	26.05 K. to 25.6 - Loss .45 Kgs.
4. Temperature	No effect.
5. Physical signs	Remained the same.

IK had no definite effect.

VIII. Wm. Geo. Coates - age 42 - Gardener.

History:-

Cough and sputum for 6 months. Father died of Pulmonary Tuberculosis.

Symptoms and physical signs on admission:-

Pale in appearance. Cough, expectoration and dyspnoea./

dyspnoea. Creps all over right side, occasionally fine crep left side.

Diagnosis:-

Chronic Pulmonary Tuberculosis.

Treatment:-

IK inunctions:-

Series - IK (6).02,.06(5).01,.06,(4).01,.03,.05, .07,(3).01, Total 9 inunctions.

Result of treatment:-

1.	Reactions	None.
2.	General condition	Same.
3.	Weight	Increased 1 lb.
4.	Temperature	In statu quo.
5.	Physical signs	Same.

IK had no appreciable effect.

IX. Reginald Loxton - age 4.

History:-

Mother has Pulmonary Tuberculosis. Seen as a contact of mother on 22.6.15. Chest was normal. Re-examined 6 months later.

Symptoms and physical signs:-

15.1.15 had cough, expectoration and night-sweats. Creps and dullness right base posterior.

Diagnosis:-

Pulmonary Tuberculosis.

Treatment:-

IK inunctions, oil and malt, and cough mixture.

Series/

Series of inunctions:-

IK (5).02,(4).02,(4).06,(3).01,.05,(2).01

Total inunctions:- 6.

Result of treatment:-

1. Reactions None.
2. General condition Improved.
3. Weight Same.
4. Temperature Same.
5. Physical signs Improved.

IK had no appreciable effect on the disease.

X. Robert Parsons - age 8 - Scholar.

History:-

Nothing to note.

Symptoms and physical signs:-

Cough, dyspnoea, and night-sweats.

Chest nil.

Diagnosis:-

Tuberculous gland left side of neck.

Treatment:-

Cod-liver-oil and IK inunctions.

Series of inunctions:- IK (6).02,.06,(5).01,.05.

Total:- 4 inunctions.

Patient then sent to hospital for surgical treatment.

Result of treatment:-

1. Reactions None.
2. General condition In statu quo.

3./

3. Weight	Unaltered
4. Temperature	In statu quo.
5. Physical signs	In statu quo.

IK had no appreciable effect on the condition.

XI. Kathleen Sutton - age 7 - Scholar.

History:-

Delicate since early childhood.

Symptoms and physical signs:-

Swelling left side of neck.

Bronchial breathing and dullness right apex, scattered creps over most of the lungs at the end of inspiration, disappear on deep breathing.

Eustace Smith sign positive.

Diagnosis:-

Pulmonary Tuberculosis.

Treatment:-

Cod-liver-oil, rubbing-oil, and IK inunctions.

Series of inunctions:- IK (orig.) .02,.04,.06,.08, .008,.01,.02,.03,.04,.05,.06,.08,.1.

Total:- 13 inunctions.

Result of treatment:-

1. Reactions	Rise of temperature after IK .08, probably not due to IK, similar rise previously when not on IK treatment. No focal reaction in cervical glands.
2. General condition.	Improved.
3. Weight	Increased from 30.05 to 31.15 Kgs.
4. Temperature	unaffected.

5. Physical signs Variable.

IK had no definite effect on the disease.

XII.

Winifred Miles - age 19 - Housework.

History:-

Weak throat, cough for 3 weeks, Sister died of Pulmonary Tuberculosis.

Symptoms and physical signs:-

Has cough, dyspnoea, and night-sweats.

Dullness and prolonged expiration at the right apex.

Diagnosis:-

Pulmonary Tuberculosis L_1S.

Treatment:-

Oil-and-malt, guaicose, and IK inunctions.

Series of inunctions:-

IK (5).02,.06,.08,.1,(4).03,.06,(3).01,.05,.1, .15,(2).03,.05.

Result of treatment:-

1. Reactions	4 local reactions. After IK (5).1 cc very severe local reaction, large red area of 3 inches diameter. Showed an area of red desquamated appearance 14 days after the injection. Doubtful febrile and general reaction after the same dose.
2. General condition	Unaltered.
3. Weight.	Decrease from 6 St. 5 lbs. to 6 St. 0 lb. 4 oz. Loss $4\frac{3}{4}$ lbs.
4. Temperature	Unaltered.

5. Physical signs — In statu quo.

IK had no definite effect on the disease.

XIII.

Sydney Barrington - age 20 - Labourer.

History:-

Dyspnoea and weakness for 12 months. Only off work for 1 month.

Symptoms and physical signs on admission:-

a. Bright, hectic cheeks, emaciated. Cough, expectoration, night-sweats, and dyspnoea.

b. Dullness and creps most of R. lung.

Vomica, bronchial breathing right apex. Few creps, left apex.

Diagnosis:-

Pulmonary Tuberculosis L_3S.

Treatment:-

Oil-and-malt, cough mixture, and IK inunctions.

Series of inunctions:-

IK (7).05,.07,(6).01,.05,(5).01,.05,(4).01,.05, (3).01,.05.

Total:- 10 inunctions.

Result of treatment:-

1. Reactions	None.
2. General condition	In statu quo.
3. Weight	9 St. 6 lbs. 6 oz. to 9 St. 4 lbs. 12 oz. Loss 1 lb. 10 oz.
4. Temperature	Unaffected.

5./

5. Physical signs In statu quo.

IK had no definite effect on the disease

XIV.

Ethel Morgan - age 27 - Draper's assistant.

History:-

Had cough last spring and also the spring before. Had pain in left side then.

Symptoms and physical signs on admission:-

a. Cough, pain in left side on deep breathing, loss of weight, dyspnoea, and tiredness.

b. On 2.3.14 some dullness at left side and at base posteriorly.
On 27.3.14 left base no physical signs. Prolonged expiration at right apex.

Diagnosis:-

Pulmonary Tuberculosis L_1S.

Treatment:-

Sanatorium for 3 months followed by Dispensary treatment which comprised cod-liver-oil, medicines, and IK inunctions.

Series of IK injections:-

IK (7).2 cc, (6) .04, .06, .1, (5).03,.06, .08, (4).01.

Total:- 8 injections.

Result of treatment:-

1. Reactions. 3 slight local reactions. Had a doubtful reaction angina. No general or febrile reactions.

2. General condition Improved.

3. Weight 7 St. 9 lbs. 6 oz. - 7 St. 6 lbs. 10 oz. Loss 2 lbs 10 oz.

4. Temperature — Unaffected.

5. Physical signs — In statu quo.

IK had no appreciable effect.

XV.

Bertie Brown - age 9 - scholar.

History:-

Delicate since infancy.

Symptoms and physical signs on admission:-

a. Cough, expectoration, dyspnoea, palpitation, diarrnoea, all plus. Haemoptysis slight.

b. Coarse creps over whole right lung. Left lung anterior free of creps.

Diagnosis:-

Chronic Pulmonary Tuberculosis.

Treatment:-

Oil-and-malt and inunctions.

Series of inunctions:-

IK(7).02 cc, (6).02,.04,.08. Total 4 inunctions.

Result of treatment:-

1. Reactions — After IK (6).02 cc temperature rose to 101° and 102° F. for 4 days and haemoptysis occurred but doubtful if the result of the inunctions.

2. General condition — Same.

3. Weight — Same.

4. Temperature — No definite effect.

5. Physical signs — In statu quo.

IK had no effect, but only 4 inunctions given.

XVI./

XVI.

Charles Book - age 34 - Carter.

History:-

Symptoms of the disease for 2 years. Father died of Pulmonary Tuberculosis.

Symptoms and physical signs on admission:-

a. Cough, expectoration, dyspnoea, palpitation, pain in chest, night-sweats, catarrh and weakness. Haemoptysis about 18 months ago and sputum streaked 1 month ago.

b. Right apex, retraction, dullness, bronchial breathing, and vocal resonance plus.

Left base posterior, dullness, crepitations, occasionally a crepitation left 3rd and 4th space anterior.

Diagnosis:-

Pulmonary Tuberculosis L_2S.

Treatment:-

a. General treatment - Oil-and-malt - Cough mixtures.

b. Tuberculin injections.

Series:-

S.B.E.(4).01,.015,.02,.03,.04,.05,.06,.08,.1 cc, .15 cc, .2 cc.

S.B.E.(3) .02.

S.B.E.(4) .1,.08,.1,.15 cc.

S.B.E.(3) .02,.03,.05,.08,.12,.17 cc.

S.B.E.(2) .02,.03,.05,.07,.1,.15 cc,.15,.15.

Weight at commencement of Tuberculin treatment was 9 St. 6 lbs. 8 oz. Weight at end was 9 St. 4 lbs. 8 oz.

Physical signs and general condition were in statu quo.

c. IK injections.

Commenced on 26.2.15. Ceased on 4.6.15.

IK series:-

IK(7).2 cc, .4 cc, (6).06,.1 cc,(5).03,.06 cc, .08 cc,(4).01 cc.

Total:- 8 injections.

Result of treatment:-

1. Reactions	Slight local reaction after IK(7).4 cc. No general, febrile or focal reactions.
2. General condition	Same.
3. Weight	9 St. 4 lbs. 7 oz. to 9 St. 3 lbs. Loss of 1 lb. 7 oz.
4. Temperature	Unaffected.
5. Physical signs	Unaltered.

IK had no definite effect.

C. Combined Rapid and Gradual Method.

XVII.

Gordon Smith - age 5 - Scholar.

History:-

The case showed no marked signs of Pulmonary Tuberculosis and would by some be regarded as a so-called "pre-tuberculous" case. Sent to the dispensary by the school Medical Officer. He had suffered from sickness, faintness, and lassitude for 1 month.

Symptoms and physical signs on admission:-

a./

a. Patient was thin, pale and easily tired. He was rather under-sized and had occasional night-sweats, faintness and sickness.

b. Physical signs were slight; prolonged expiration at right apex; occasionally dry rhonchus over chest.

No signs of Tuberculous bronchial glands, Eustace Smith sign was negative, no enlargement of the external thoracic veins. Ewart's area was normal, and the reaction to Von Pirquet's test was slightly positive.

Diagnosis:-

Early Pulmonary Tuberculosis. Turban I.

Treatment:-

a. On general treatment for 8 months, open air, Oleum Morrhuae and Syr. Ferri Phosp. Comp. His weight only increased from 14.8 Kgs. to 16.4 Kgs.

b. Inunctions of IK.

Series:-

IK (4).02 cc, IK(3).02 cc, IK(2).02 cc,.04 cc, .08 cc.

Total:- 5 inunctions; first 3, rapid method, last 2 gradual. At this stage patient was admitted into Sanatorium.

Result of treatment:-

1.	Reactions	None.
2.	General condition	Improved.
3.	Weight	16.4 K. to 16.95 Kgs. Increase .55 K.
4.	Temperature	Unaffected.
5.	Physical signs	Same.

IK had no appreciable effect on the disease.

XVIII.

Dorothy Fox - age 10 - Scholar.

History:-

Complained of cough and tiredness for 2 months.

Symptoms and physical signs on admission:-

a. Cough, tiredness, slight expectoration, and pain across stomach occasionally.

b. Bronchial breathing at right apex. Von Pirquet plus.

Diagnosis:-

Early Pulmonary Tuberculosis. L, s.

Treatment:-

Cod-liver-oil, cough mixtures, and inunctions.

IK inunction series:-

IK(4).02 cc, IK(3).02 cc, (2).02 cc, .04 cc,.08 cc,(1).01 cc.(orig.).02,(1).02,.06,(2).06.

Result of treatment:-

1.	Reactions	None.
2.	General condition	Same.
3.	Weight	30.6 K. - 30.45 K. Loss .15 Kgs.
4.	Temperature	Unaffected.
5.	Physical signs	Same.

IK had no appreciable effect on the disease.

XIX.

Alfred Ernest Maggs - age 31 - Miner.

History:-

Pleurisy 6 years ago and frequently since.

Symptoms and physical signs on admission:-

a./

a. Cough and expectoration sometimes in morning. Pale and rather emaciated. Stabbing pain in chest on breathing, for 3 weeks.

b. Creps left side upper part. Right side prolonged expiration anterior; dullness at apices.

Diagnosis:-

Pulmonary Tuberculosis.

Treatment:-

a. Cod-liver-oil, Guaicose and Easton's Syrup.

b. Tuberculin:- T BK(5).1 cc. to T BK.(4) .01 cc - 8 dozes. Not much improved.

c. IK injections:-

1 Rapid method.

Series:- IK (7).2 cc, IK(5).02 cc, IK(5).2 cc,

IK (3).02 cc, IK (3).2 cc.

Between doses IK(3).2 cc, and IK(6).02 cc an interval of 6 months had elapsed when patient resumed work in the mine.

Weight had increased from 58.8 Kgs. to 59.2 Kgs.

Lungs were in pretty much the same state.

2. Gradual IK method:-

Series:- IK (6).02,.02,.4,.6,.8, 1 cc

IK (4).02,.04,.08,.1, .2 cc

IK (3).04 cc.

Result of treatment:-

1. Reactions	2 local reactions, no febrile or general reactions.
2. General condition	Same.
3. Weight	Increased from 58.8 Kgs. to 60.1 Kgs.
4. Temparature	Improved.

5. Physical signs In statu quo.

IK had no appreciable effect on the disease.

XX.

Amy Porter Hulin - age 23 - Housework.

History:-

Cough 18 months. Haemoptysis 18 months and 15 months ago.

Symptoms and physical signs on admission:-

a. Appearance pale and thin; complains of loss of weight, pain and weakness. Cough, expectoration and dyspnoea very bad. Sweats in early morning.

b. Dullness, bronchial breathing, vocal resonance plus, retraction of right apex.

Diagnosis:-

Pulmonary Tuberculosis L_1s.

Treatment:-

a. General treatment.

b. IK treatment by both the rapid and gradual methods and by injection and inunction.

1. One injection IK (6).02 cc.

2. IK inunction series:-

IK(6).02,(5).02,(4).02,.08,(3).01,.03,

.05,(5).05.

Total 8 inunctions.

Result of treatment:-

1. Reactions After injection of IK(6) .02 cc, her eyes and face swelled up and she felt ill. No albuminuria. She then started inunctions. Very doubtful local reaction once, appearance of subcutaneous ecchymosis, probably due to the rubbing/

	rubbing in of the IK in lanoline into the arm by means of a glass rod. Febrile reaction after IK(6).02 cc and IK(3) .05 cc; doubtful if due to the IK.
2. General condition	Same.
3. Weight	46.6 K. - 44.7 K. Loss of 1.9 K.
4. Temperature	Unaffected.
5. Physical Signs	In statu quo.

IK had no appreciable effect on the disease.

XXI.

Laura Thorne - age 18 - Cigarette factory hand.

History.

Cough and sputum 3 months. Sputum blood-streaked once. Family history bad.

Symptoms and physical signs on admission:-

a. Cough, expectoration and slight haemoptysis. Dyspnoea.

b. Dullness at apices, creps left apex.

Diagnosis:-

Pulmonary Tuberculosis L_1s.

Treatment:-

Was sent to Sanatorium for 4 months. Weight rose from 7 St. 4½ lbs. to 9 St. 2 lbs.

For 1 month after return weight increased; then some fresh creps appeared at left interscapular area. One month later coarse creps appeared all over left lung; creps right apex and right interscapular area. She seemed to suddenly get worse at this time and lost weight - 14 lbs. - steadily until sent to Sanatorium again.

IK inunctions (before admission to sanatorium for the second time):- IK(6).02,.04. No effect.

IK injections given by Medical Superintendent of Sanatorium:-

IK(7).1 cc,.12,.14,.18,.3,.4,.3, .3,.4,.55,.62, .72,.9,.1,.1 cc.

Patient returned from Sanatorium 5 - 6 months later. Weight fell from 50.8 K. to 49.05 K. while at Sanatorium.

Treatment at Dispensary on return from Sanatorium:-

a. General treatment.

b. IK inunctions.

Series of inunctions:- IK(5).05,(4).01,.04,(3) .04,(2).04,(4).04,(3).04(2).02.

Total:- 17 injections and 8 inunctions of IK.

Result of treatment:-

1. Reactions	One or two slight febrile reactions; no local or focal reaction.
2. General condition	Worse.
3. Weight	Fell from 53.5 K. to 45.25.
4. Temperature	Unaltered.
5. Physical signs	Gradually got worse.

IK had no effect on the downward course of her disease.

XXII.

Samuel Pope, - age 36 - Labourer.

History:-

Cough 14 months. Brother died of Pulmonary Tuberculosis/

Tuberculosis 13 months ago.

Symptoms and physical signs on admission:-

a. Cough, expectoration and dyspnoea.

b. Bronchial breathing and dullness at apices. Creps at right upper lobe posterior.

Diagnosis:-

Pulmonary Tuberculosis $L_2 s$.

Treatment:-

a. Was sent to Sanatorium for 4 months but not improved. Lost 1 lb. Creps more extensive on right side and fresh creps left base anterior.

b. General treatment.

c. IK injections.

Series of injections:-

IK(7).1,(6).05,(6).5,(5).5,(4).4,(6).04,(5).04, (4).04,.35,(3).35,(1).04,.(3).04,(6).04,.06, .08,.1,.3,.5.

Total:- 18 injections.

Result of treatment:-

1. Reactions	None.
2. General condition	Worse.
3. Weight	Fell from 8 stone 12¾ lbs. to 8 stone 1½. Loss of 11¼ lbs. Ceased to lose weight when IK was stopped.
4. Temperature	Unaffected.
5. Physical signs	In statu quo.

IK had no definite effect on the disease, but perhaps made it worse.

XXIII.

Arthur Hazell - age 30 - Painter and tax collector.

History:-/

History:-

Cough since pleurisy with effusion 5 years ago. One sister and one brother died of Pulmonary Tuberculosis.

Symptoms and physical signs on admission:-

a. Cough, sxpectoration, pain and night-sweats.

b. Dullness and crepitations R. upper and middle lobes, slight dullness and one or two creps at L. apex.

Diagnosis:-

Chronic Pulmonary Tuberculosis. L_3s.

Treatment:-

Oil and Malt, 3i. t.d.s.p.c.

IK (6).2,(5).04,(4).04,(3).2,(4).02,(3).02, (3).2,.3.

Total:- 8 injections.

Result of treatment:-

1.	Reactions	None.
2.	General condition	Worse.
3.	Weight	Increased 1 lb.
4.	Temperature	Unaffected.
5.	Physical signs	In statu quo.

IK had no apparent effect.

XXIV.

Florence Brooks - age $12\frac{1}{2}$.

History:-

History of cough, expectoration, occasional coughing of blood, and shortness of breath for 8 years since an attack of whooping-cough.

Symptoms/

Symptoms and physical signs:-

a. Cough, sputum, pain in R. side, dyspnoea, and sputum streaked with blood.

b. Creps and rhonchi scattered over both lungs.

No definite physical signs of T.B.Bronchial glands.

Von Pirquet doubtfully positive.

Diagnosis:-

Chronic Pulmonary Tuberculosis. Bronchitic type.

Treatment:-

General:- Oil and Malt, stimulant cough mixture, and rubbing oil.

IK inunctions - series:-

IK,.00002 cc,.0002 cc,.002 cc,.004 cc,.006 cc, .008 cc, .01 cc,.02 cc,.03 cc,.04 cc,.06 cc.

Total:- 11 inunctions.

Result of treatment:-

1. Reactions	No local reaction. One doubtful febrile and general reaction after IK .002 cc. Temperature 101°F. for two nights, above normal for four days, had headache. On Dec.12.1915 she had a similar rise of temperature when she was not on IK.
2. General condition	Improved.
3. Weight	29.7 K. - 29.5 K. Lost .2 K.
4. Temperature	Unaltered.
5. Physical signs	Unaltered but very variable.

IK had no effect on her condition.

XXV.

James Ingram. Age 60. Lamplighter.

History:-

Cough and shortness of breath for 6 months.

Symptoms and physical signs on admission.

a. Cough, expectoration, dyspnoea, pains in chest, night-sweats and bad appetite.

b. R. Lung anterior. Bronchial breathing, creps and dullness to 4th rib.
R. Lung posterior. Dullness and creps R. suprascapular area.
L. Lung anterior. Dullness, creps and rhonchi all over.
L. Lung posterior. Dullness, creps and rhonchi suprascapular area; rhonchi L. base.

Diagnosis:-

Chronic Pulmonary Tuberculosis - $L_3 s$.

Treatment:-

General:- Cough mixture, oil and malt.

IK, (7),.2 cc, (5),.02 cc,(5),.2 cc,(3),.02 cc, (7).2 cc,.7 cc, (5),.07 cc, (4),.07 cc, (4), .7 cc, (2), .07 cc, (4).07 cc (5).07 cc,(4).07 cc,(3).07 cc,(2).07 cc,(2).55 cc, (Orig.) .05 cc, (2).02 cc,(6).02 cc,(5).02 cc,.04 cc,.06 cc, .08 cc,.1 cc,.3 cc,(4).05,.07 cc.

Total number of injections:- 27.

Result of treatment:-

1. Reactions — Slight local reaction once. No definite febrile reaction as result of injection. He had numerous, high, sudden, short fluctuations of temperature but as often as not these had no definite relationship to the injections of IK.

No definite lytic focal reactions, increase in sputum and cough sometimes but probably due to the normal fluctuations of the disease. Relieving injections sometimes given on the assumption that the increase of sputum might be lytic in origin.

2. General condition — Worse.

3. Weight — 8 St. 4 lb. - 8 St. $2\frac{3}{4}$ lb. Lost $1\frac{1}{4}$ lb.

4. Temperature — Unaltered.

5. Physical signs — In statu quo.

IK had no effect on the course of his disease. He died 3 months later.

XXVI.

Mina Webb. Age 17. Housework.

History:-

Had always been delicate. Had cough since two years of age.

Symptoms and physical signs on admission:-

a. Cough, expectoration, dyspnoea, and weakness. Very pale and thin in appearance.

b. Coarse creps and rhonchi over whole of both lungs.

Diagnosis:-

Chronic Pulmonary Tuberculosis and chronic Bronchitis.

Treatment:-

General:- Oleum Morrh., Syr. Parrish, Guaicose.

Had 2 injections of S.B.E. followed by the following IK injections:-

IK(6).02 cc,(5).02 cc,(4).02 cc,(3).02 cc,(2).02 cc,(4).02 cc,(3).02 cc,.04 cc,.06 cc,.08 cc,.1 cc,(2).05 cc,.07 cc,(2).1 cc,(2).24 cc,(1).04 cc,(1).06 cc,.075 cc,.075 cc,.1 cc,.075 cc.

Total:- 21 Injections.

Result of treatment:-

1. Reactions — 5 local reactions, causing red, tender swellings

sub/

	subcutaneously lasting 2 - 7 days. 2 Febrile reactions - after IK(1) .1 cc, and IK(2).02 cc.
2. General condition	Worse.
3. Weight	6 St. 4⅛ lbs. - 6 St. 4¼ lbs. Lost ¼.
4. Temperature	Unaltered.
5. Physical signs	In statu quo.

Died 2 months after cessation of IK treatment.

IK had no retarding effect on the course of her illness.

XXVII.

Nellie Saunders. Age 16. Daily domestic work.

History:-

Duration of illness indefinite. Always had a cough. Off work 5 weeks. No family history of Tuberculosis.

Symptoms and physical signs on admission:-

a. Appearance, pale and flabby. Cough severe, expectoration, thick and purulent; dyspnoea, palpitation, night-sweats.

b. R. apex prolonged expiration. Dullness and creps R. apex posterior; creps at R. 4th space anterior.

Larynx normal.

Diagnosis:-

Pulmonary Tuberculosis - L_2s.

Sent to sanatorium for 3 months.

Physical signs on return from Sanatorium:-

Coarse creps R. base anterior and R. axilla.

Prolonged expiration R. apex.

Treatment at Dispensary:-

General:- Oil-and-malt, cough mixtures.

Physical signs at commencement of IK treatment:-

Creps both bases anterior and axillae.

Series of injections:-

IK(6).02 cc,.2 cc,(4).02 cc,.2 cc,(3).2 cc, (4).02 cc, (relieving injection) (4).06 cc, .1 cc,(3).05 cc,.08 cc,.1 cc,(2).03 cc,.05 cc, .07 cc,.1 cc,.1 cc,.15 cc,.25 cc,.4 cc,.65 cc, .95 cc,(1).15 cc, (Orig.) .02 cc,.03 cc,.05 cc, .07 cc,.1 cc,.1 cc, (.01).15 cc,.3 cc.

Total:- 31 Injections.

Result of treatment:-

1. Reactions	1 local reaction after IK (3).2 cc:- Swelling and redness of arm of area size of 2/- piece lasting 2 days. 2 focal reactions (a) after IK (6).02 cc and (b) after IK (3).2 cc:- Focal reaction consisted of increased creps. No general reaction. No febrile reaction.
2. General condition	Improved.
3. Weight	Fell from 57.2 K. to 54.3 K.
4. Temperature	Improved.
5. Physical signs	Improved.

IK had no definite effect but patient improved somewhat under it.

D. Tuberculin treatment followed by IK.

XXVIII.

Ivor Swift. Age 6. School-boy.

History:-

Not well since 6 months old.

Symptoms and physical signs on admission:-

a. Cough, expectoration and dyspnoea.

b. Rhonchi all over.

Diagnosis:-

Chronic bronchitic type of Pulmonary Tuberculosis.

Treatment:-

General:, Cod-liver-oil, cough-mixtures and rubbing oil. Result at end of 3 - 4 months:- Creps appeared at R. base of lung.

Tuberculin treatment:- T. BK.(5).02 cc, to T. BK. (4).2 cc. Very gradual increase in dose - course extended over a period of 9 months.

Result of Tuberculin treatment:-

Weight increased from 17 K. to 19.1 K.

Physical signs were unaltered.

IK treatment:-

IK.(6).02 cc,IK(6).06 cc,.1 cc,.2 cc,.4 cc, .6 cc, IK (5) .06 cc.

Total:- 7 injections.

Result of IK treatment:-

1. Reactions. After the injections IK (6).6 cc and IK (5) .06 cc had 2 marked reactions, febrile and general. Both were attacks of asthmatic type with partial asphyxia, cyanosis, and tremors; also malaise so child was put to bed. Febrile reaction after IK(6) .6 cc. On night of injection. Temperature was 101.8 F. next morning 100.2 F., next night 102.4 F.; fell to 100 F. next day and remained up to 100 F. till 11 days had elapsed.
   Arm also sore locally, discoloured area was ½ inch in diameter.

This/

This dose therefore caused local reaction, febrile and general reaction, but no apparent focal reaction.

IK (5).06 cc. Temperature went even higher, same night was 103.6 F.; 3 days later temperature was 102.2 F. fell by lysis on 7th day.

No local reaction or focal reaction this time. This effect is contrary to Spengler's view that with small doses where lytic reaction occurs the dose should be increased and the lytic reaction ceases.

IK therefore in this case showed local, general, and febrile reaction but no focal reaction.

2.	General condition	Worse.
3.	Weight	Fell from 19.4 K. to 17.25 K.
4.	Temperature	Marked rise.
5.	Physical signs	Seemed improved but doubtful if due to the IK. The effects were like those of anaphylaxis. No effect on cough or sputum.

XXIX.

Emma Parfitt. Age 34. Salvation Army Officer.

History:-

Had pleurisy at 27. Duration of present illness 8 months. Returned 1 month ago from Sanatorium where she had been 3 months. No family history of Tuberculosis.

Symptoms and physical signs on admission:-

a. Cough, dyspnoea, and pain in L. shoulder, all slight. General condition not very good. Temperature variable and easily upset.

b. Disease chiefly confined to apices, fine creps and prolonged expiration.

Diagnosis:-

Pulmonary Tuberculosis. Turban I to II.

Treatment/

Treatment:-

General:- Cod-liver-oil, Guaicose, Syr. Ferri. Phosp., Cough Mixtures.

Tuberculin treatment was given for 2 months commencing with P.T.O.(5).1 cc and concluding with P.T.O.(5).8 cc. Total 10 doses.

No improvement in physical signs or general condition.

Sent to Sanatorium again for 4 months. No improvement followed. Temperature 100.4 F. in evening.

Physical signs remained the same.

IK treatment:- IK(6).02 cc,.2 cc, (Rapid method) IK(4).02 cc,.04 cc,.06 cc,.08 cc,.1 cc. (Gradual method). Total number of doses of IK:- 7.

Result of Treatment:-

1. Reactions	2 slight local reactions.
2. General condition	Unaltered.
3. Weight	64.5 - 63.5 Kgs. Lost 1 K.
4. Temperature	In statu quo.
5. Physical signs	Slightly improved.

IK had no appreciable effect on the disease.

XXX.

Wm. Geo. Pottecary. Age 50. Horsedriver.

History:-

Duration about 9 months commencing with influenza. /

influenza. Has had influenza every winter for years. No history of Tuberculosis in family.

Symptoms and physical signs on admission:-

a. Cough, severe; expectoration, profuse; dyspnoea and night-sweats severe. Pain in L. side and haemoptysis - slight - 1 week ago.

b. Bronchial breathing, creps. Vocal resonance plus upper parts of both lungs.

Myotatic irritability and Myoidema both plus.

Diagnosis:-

Pulmonary Tuberculosis L_3s.

Treatment:-

a. For first five months on general treatment only. This included shelter, cod-liver-oil and cough mixtures.

b. Tuberculin injections followed and were given for 5 months. Commencing dose T.Bk. (5).1 cc to T.Bk. (3).03 cc (concluding dose) Total number of doses:- 15.

Result of Tuberculin Treatment:-

No improvement in physical signs or general condition. Weight fell from 67.4 to 67.2 Kgs.

c. IK treatment:-

Series:- IK(7).2 cc,IK(6).2 cc,.4 cc,.6 cc, .6 cc,IK (5).08 cc,.1 cc,.3 cc,.5 cc,IK (4) .5 cc.

Total:- 10 doses of IK.

Result of IK treatment:-

1. Reactions — Severe local reaction after IK (6).6 cc, general reaction doubtful.
3 ? febrile reactions:- 101 .2 F., 100.2 F., 100.6 F. It is doubtful whether these rises of temperature were due to the IK as he sometimes had similar rises of Temperature under Tuberculin apart from an injection.

2.	General condition.	Worse.
3.	Weight	65.7 K. to 61.5 Kgs. Loss 4.2 Kgs.
4.	Temperature	Unaffected.
5.	Physical signs	In statu quo.

IK had no appreciable effect on the disease.

XXXI.

Harry Ford. Age 5. School-boy.

History:-

Mother is suffering from Pulmonary T.B.

Diagnosed as result of contact examination.

Symptoms and physical signs on admission:-

a. Cough, sickness.

b. Creps L. base, vesiculo - bronchial breathing interscapular areas.

Von Pirquet test plus.

Diagnosis:-

Pulmonary Tuberculosis.

Treatment:-

a. General:- Cod-liver-oil, cough mixtures, and rubbing oil.

b. Tuberculin Injections:- For 4 to 5 months injections were given, commencing dose of T.Bk. (5).1 cc, final dose T.Bk. (3),.3 cc. Weight increased from 16.5 K. to 18.1 K. Creps increased.

c. IK inunctions:-

The following doses of IK were then given:-

IK(6).02 cc,.06 cc,.01 cc,.5 cc,(4).02 cc, (3).03 cc,(2).02 cc,(1).02 cc,.04 cc,(2) .04 cc, .08 cc,(1).02 cc (Orig.).03 cc,

(2).03 cc. Total 14.

Result of treatment:-

1. Reactions	? febrile reaction 2 days after IK (6) .06 cc.
2. General condition	Improved markedly, appeared much better, appetite better.
3. Weight	Increased from 18.3 K. to 18.4 Kgs.
4. Temperature	Unaffected.
5. Physical signs	Slight improvement.

Under IK he appeared to improve considerably.

XXXII.

Fred Gullick. Age 35½. Miner.

History:-

Eight months illness. No family History of Tuberculosis.

Symptoms and physical signs on admission:-

a. Cough, expectoration, palpitation, dyspnoea, and pain in throat, also hoarseness.

b. Numerous scattered creps over front of chest, L. apex posterior dullness; prolonged expiration R. apex.
Larynx arytenoid swollen and oedematous, L. cord ulcerated, l. false cord surface roughened.

Diagnosis:-

Pulmonary Tuberculosis L_3s and Larynx.

Treatment:-

a. General:- Cod-liver-oil, cough mixtures, Guaicose and inhalations of Allii Sativi.

b. Tuberculin injections T. Bk.(5).1 cc and T.R.(5).1 cc.

c./

c. IK injections were given as follows:-

IK(7).2 cc,(6).02 cc,(5).02 cc,(4).02 cc,(4) .2 cc,(3).2 cc,(3).4 cc,(3).6 cc,(3).8 cc, (3) 1 cc. Total:- 10 doses.

Latterly patient attended irregularly as he had resumed work in the mines.

Result of treatment:-

1. Reactions	None.
2. General condition	In statu quo.
3. Weight	67.5 K. to 66.3 Kgs. Lost 1.2 Kgs.
4. Temperature	Unaffected.
5. Physical signs	Some improvement.

IK had no effect.

XXXIII.

Edith Witcombe. Age 9. Scholar.

History:-

Delicate for 6 years. Had Bronchitis, Pertussis and double Pneumonia three times.

Symptoms and physical signs on admission:-

a. Cough.

b. Creps bases posterior and L. base anterior.

Von Pirquet test positive.

Very large Xiphisternal fossa owing to previous pneumonia and deficient expansion, also causing displacement of heart to left side.

Diagnosis:-

Chronic Pulmonary Tuberculosis.

Treatment./

Treatment:-

General:- Cod-liver-oil and malt. On this treatment her weight increased from 20.8 K. to 24.8 Kgs.

IK inunctions by rapid method were given as follows:-

IK .00002 cc,.0002 cc,.002 cc,.01 cc,.02 cc, .03 cc, .04 cc,.05 cc,.005 cc,(relieving inunction),.008 cc,.02 cc,.01 cc. Total 12 doses.

Result of treatment:-

1.	Reactions	None.
2.	General condition	Improved.
3.	Weight	24.9 K. to 23.3 Kgs. Lost 1.6 Kgs.
4.	Temperature	Unaffected.
5.	Physical signs	Unaltered.

No appreciable effect from IK inunctions.

XXXIV.

Mildred Woodley. Age 24. Domestic Servant.

History:-

Off work for 6 months with nervous breakdown.

no family history of Tuberculosis.

Symptoms and physical signs on admission:-

a. Cough, expectoration, both slight in morning; dyspnoea and palpitation. Sputum streaked one year ago.

b. Occasional crep on expiration 1st space L. side.

Diagnosis:-

Pulmonary Tuberculosis.

Treatment:-/

Treatment:-

a. General:- Cod-liver-oil, Syr. Parrish, Mist. Ferri. et Ammon Cit., and cough mixtures.

b. Tuberculin:- Started with B.E. as temperature was always above normal.

Series:- B.E.(4).01 cc,.02 cc,.03 cc,.03 cc, .04 cc,.06 cc,.08 cc,.1 cc,.15 cc,.2 cc,.3 cc, .4 cc,; weight fell from 47.2 K to 45.25 Kgs. Stopped B.E. for one month. B.E.(3) .02 cc,.04 cc,.06 cc,.08 cc,; weight 44.4 Kgs.; still slight indefinite physical signs at apices.

c. IK injections:-

Series:- IK(6).02 cc,.2 cc,(4).02 cc,.2 cc, (3).2 cc,.5 cc,(2).1 cc,(Orig).01 cc,.5 cc, (1).08 cc,.15 cc,(1).3 cc,(Orig.).05 cc, .07 cc,.1 cc,.01 cc,.1 cc,.15 cc,(2).1 cc.

Total 19 injections of IK.

Result of treatment:-

1. Reactions	3 local reactions slight after IK(3).2 cc.; severe local reaction after IK (2).1 cc; very severe local reaction after IK (2).5 cc.
2. General condition	Same.
3. Weight	44.1 K. to 42.9 Kgs.; loss 1.2 Kgs.
4. Temperature	Unaffected.
5. Physical signs	Unaltered.

IK had no appreciable effect on the disease.

XXXV.

Emily Clark. Age 26. Draper's assistant.

History:-

Illness said to commence 2 years ago. Had been in Sanatorium for six months. Returned one year ago.

Symptoms and physical signs on admission:-

a. Cough, expectoration, slight haemoptysis, and pain in R. side.

b. Dullness bronchial breathing R. upper lobe anteriorly and posteriorly; creps in the R. axilla. Bronchial breathing and creps R. interscapular area. Dullness and bronchial breathing L. apex.

Diagnosis:-

Pulmonary Tuberculosis $L_3 s$.

Treatment:-

a. General:- Cod-liver-oil, guaicose, cough mixtures and inhalations of Allii Sativi.

b. Tuberculin injections of B.E. followed by injections of P.T.O. were given for a period of 7 months. Total number of doses 33.

c. IK. inunctions.

Series:- IK(6).02 cc,.12 cc,(5).03 cc,.06 cc, .1 cc,(6).1 cc,(4).01 cc,.05 cc, Total 8 inunctions.

Result of treatment:-

1. Reactions	None.
2. General condition	Worse.
3. Weight	6 St. $8\frac{3}{4}$ lbs. to 6 St. 3 lbs. Loss $5\frac{3}{4}$ lbs.
4. Temperature	Worse.
5. Physical signs	Worse.

IK had no effect on the advancing nature of her condition.

XXXVI.

Ada Bessant, age 23. Laundry shop-assistant.

History:-

Had pleurisy 4 years ago R. side. Subject to colds for years.

Symptoms and physical signs on admission:-

a. Cough, expectoration occasionally, night-sweats for a few weeks.

b. Dullness, creps, retraction upper half of right lung.

Diagnosis:-

Pulmonary Tuberculosis. L_2s.

Treatment:-

Sent to sanatorium where she had P.T.O. injections. Returned 4 months later and P.T.O was continued at Dispensary. Physical signs on return were worse. More creps on R. side, some fresh creps L. side.

After 6 months of P.T.O. injections at Dispensary physical signs remained pretty much the same. Weight fell from 7 St. 2 lbs. to 6 St. 8 lbs.

General treatment:- Cod-liver-oil, Syr. Ferri. Phosp. Co., and cough mixtures.

IK. injections were given as follows:-

Series:- IK(7).2 cc,(5),.02 cc,(4),.02 cc,.2 cc, (3),.2 cc, (3),.02 cc,(2),.02 cc,(2),.2 cc,(1), .3 cc.

Total:- 9 injections of IK.

After IK (1),.2 cc the temperature rose to 100.4 on the same night, 101 on the next night and 100 for the three following nights. She also felt ill, shivery and had headache, with slight increase in cough and sputum. ? focal reaction.

Nine days later the temperature rose again for four days on Jan. 31.1915. It then remained down for a week, after which it again rose to 102-104°. The temperature remained high from 11th. Feb. to 11th March with one remission. During this period she was very seriously ill with pneumonia and was under the care of her own doctor. On April 13th the temperature rose to 102 and remained with a daily range from 98 to 100. She then recovered sufficiently to attend the Dispensary on May 21st. The physical signs then were:-

R. lung:- marked dullness, coarse creps all over.

V.R. plus R. side posterior

V.R. minus R. side anterior.

L. apex posterior:- bronchial breathing, V.R. plus.

Result of treatment:-

1. Reactions	See above summary of case.
2. General condition	Worse.
3. Physical signs	Worse.
4. Temperature	Worse.

5. Weight Lost weight continually.

IK apparently made her condition worse.

XXXVII.

Mrs Francis West. Age 35. Housewife.

History:-

Husband died of Pulmonary Tuberculosis. Complained of cough and tiredness one year. Returned from Sanatorium, where she had been treated for 24 weeks, 6 months ago.

Symptoms and physical signs on admission:-

a. Very pale and thin in appearance. Cough after exercise, expectoration plus, tenderness over the chest. Repeated haemoptysis till 2 months ago. Previous night-sweats. Lost 7 lbs. since return from sanatorium.

b. R. lung anterior:- Creps and dullness to 3rd rib, Bronchial breathing at apex.

R.lung posterior:- dullness R. apex to R. base.

L.lung anterior:- Creps and dullness to 3rd rib.

L.lung posterior:- Creps and dullness at apex.

Diagnosis:-

Pulmonary Tuberculosis. $L_3 s$.

Treatment:-

General:- Cod-liver-oil and malt, and cough mixtures.

Tuberculin:- Injections for 5 weeks were given but lost 3 lbs weight and physical signs especially at the left side became worse during the treatment.

IK treatment:-

Series:-/

Series:- IK (7).2,.4,(6).06,(8).06,.01,.03,.05,
.07,.09,.11,(5).03,.05,.07,.09,.11,(4).03,.04,
.06,.08,.1,.3,(3).05,.07,.09,.11,.3,(2).05,
.07,.09,(1).02,(7).2,.\5,.7,.4,(6).08,.28,(5)
.04,.08,(4).01,.05,.1 cc.

Total:- 41 injections.

Result of treatment:-

1. Reactions	5 local reactions, severe, after IK(3).3 cc, IK(7) .5 cc.
2. General condition	Worse.
3. Weight	8 St.0¾ lbs. to 7 St. 4 lbs. Lost 10¾ lbs.
4. Temperature	Worse.
5. Physical signs	Rather worse.

IK did not arrest the course of the disease.

XXXVIII.

Mary Birth. Age 20. Housemaid.

History:-

Had operation for glands - apparently Tubercular - at ages 5 and 31, and 4 months ago. Pain in chest 4 years.

Father, uncle and brother died of Pulmonary Tuberculosis.

Symptoms and physical signs on admission:-

a. Slight cough and expectoration. Pain in R side of chest. History of haemoptysis 1 drachm 1 year ago.

b. Patient had healthy-looking fat cheeks. 3 scars of operation on L. side of neck. Small glands/

glands about the size of a pea under L. jaw, gland about the size of a bean anterior to L. sterno mastoid.

Physical signs of Pulmonary Tuberculosis at R. apex indefinite.

Diagnosis:-

Tuberculous cervical glands

Incipient Pulmonary Tuberculosis L_1s.

Treatment:-

General:- Cod-liver-oil and malt, guaicose and Syrup Easton.

Tuberculin injections.

T.Bk.(4).01 cc,.01 cc,.015 cc,.02 cc,.03 cc.

Local reactions after each injection. These local reactions were very severe, causing large areas of severe redness, swelling and tenderness with blistering of the skin.

The glands also sometimes got swollen and tender.

Tried B.E. - B.E.(4).01 cc,.01 cc,.015 cc,.02 cc.

Slight local reaction also.

IK treatment:-

a. Injections of IK.:- IK(7).2 cc. 2 months later the dose was repeated and followed by IK (7) .4 cc, but as injections caused such severe local reactions inunctions were commenced. The following series of doses were given by inunction:- IK (7),.02 cc, (6),.02 cc,(5), .02 cc,.04 cc,.08 cc,(4),.01 cc,.03 cc,.06 cc, (3),.01 cc,.03 cc,(5),.03 cc,

No reactions to inunctions.

Total:- 14 doses of IK, 3 injections, 11 inunctions.

Results/

Results of treatment:-

1. Reactions. Severe local reaction after IK(7) .2 cc. Swollen red tender area of circular shape about 5 inches in diameter. Signs of redness present 3 weeks after. Glands in the neck were swollen and tender.
   IK(7),.2 cc repeated two months later:- again severe local reaction in arm: two small previously unnoticed glands in the neck became swollen.
   IK (7),.4 cc; arm very swollen, red and painful; patient also felt ill.
   Doubtful febrile reactions.
   No reactions to inunctions.

2. General condition — In statu quo.

3. Weight — 8 stone 13¼ - 8 stone 7. Loss of 6¼ lbs.

4. Temperature — Unaffected.

5. Physical signs — In statu quo.

IK had no effect on her disease.

XXXIX.

Bertha Ash. Age 32.

History:-

Ill for 5 years. Onset of present illness

Tuberculous abscesses in L. breast (T.B.found)

"Typhoid" enteritis attacks at intervals. Brother

died of Pulmonary Tuberculosis 5 years ago.

Symptoms and physical signs on admission:-

a. Diarrhoea and pain in the abdomen over the colon, melaena.

b. Dullness R. apex.

Diagnosis:-

Tuberculosis of large intestine and ? ileum.

Admitted/

Admitted to Sanatorium 26.11.1914. Physical signs then were:- Tenderness all over descending colon and transverse colon. No ascites. Prolonged expiration R. apex.

Treatment:-

Medicinal treatment:- Various remedies were tried - Bismuth, B. Naphthol, Tinct. Opii, Salol, 2% Protargol enemata, Glycerine Ichthyol enemata. Peptonised milk was also given.

Tuberculin started 18.4.1914 and 13 injections of P.T.O. were given. No improvement followed.

IK treatment was then started on 4.10.1914 and the following doses were given - 32 in all:-

IK(7).1 cc,.15 cc,.18 cc,.2 cc,.22 cc,.25 cc,.28 cc, .4 cc,.5 cc,.6 cc,.65 cc,.7 cc,.8 cc,.1 cc, (6).15 cc,.2 cc,.3 cc,.4 cc,.5 cc,.6 cc,.8 cc,(5).1 cc, .2 cc,.22 cc,.26 cc,.3 cc,.4 cc,.5 cc,.6 cc,.7 cc, .5 cc,.6 cc. Total 32.

Result of treatment:-

1. Reactions	None.
2. General condition	In statu quo.
3. Weight	?
4. Temperature	Unaffected - continuous hyper-pyrexia.
5. Physical signs	In statu quo.

IK had no effect on the disease.

XL./

XL.

John Flower. Age 10½ years. Scholar.

History:-

Duration of illness 7 years - since measles at age 3.

Mother and brother have Pulmonary Tuberculosis. Two maternal aunts died of Pulmonary Tuberculosis.

Symptoms and physical signs on admission:-

a. Cough severe, expectoration, dyspnoea, night-sweats, tiredness, and pain in left side behind.

b. Prolonged expiration and rhonchi R. apex. Creps bases posterior.

Diagnosis:-

Pulmonary Tuberculosis L_2s.

Treatment:-

General. Oil-and-malt and rubbing oil.

Tuberculin commenced 12.3.1914.

T.Bk.(5).1 cc,.15 cc,.2 cc,(4).03 cc,.04 cc,.04 cc,.05 cc,.06 cc,.08 cc,(5).8 cc,(4).1 cc,.09 cc, .1 cc,.15 cc,.2 cc,.3 cc,(3).04 cc,.06 cc,.08 cc, .1 cc,.15 cc, .2 cc,.3 cc,.5 cc,.6 cc,.6 cc,.8 cc, (2).1 cc,.14 cc,.2 cc,(1).04 cc,.06 cc,.08 cc,.1 cc, (1).15 cc,.2 cc,.4 cc,.2 cc,.4 cc,.6 cc,.8 cc, 1 cc.

Stopped T.Bk. 4.2.1915. Physical signs and general condition unaltered.

IK injections commenced 18.2.1915. Series as follows:-/

follows:-

IK(6).02 cc,.04 cc,.08 cc,.15 cc,(5).04 cc,.08 cc,
.1 cc,.3 cc,(4).05 cc,.07 cc,(3).03 cc,.03 cc,
.05 cc,.07,.1 cc,(2).03 cc,.05 cc,.075 cc,.1 cc,
.14 cc,.2 cc,.35 cc,.6 cc,.9 cc,(1).1 cc,.15 cc,
.25 cc,.4 cc,.6 cc,.8 cc,.8 cc,.1 cc,.15 cc,.22 cc.

Total 34 injections.

Result of treatment:-

1. Reactions	None.
2. General condition	Same.
3. Weight	Increased from 28.7 Kgs. to 29.3 Kgs.
4. Temperature	Unaffected.
5. Physical signs	In statu quo.

IK had no appreciable effect.

E. Tuberculin along with IK.

XLI.

Edith Atkins. Age 11 years. Scholar.

History:-

Said to have had Tuberculosis at age of 6.

Tuberculosis in both father's and mother's family.

Symptoms and physical signs on admission:-

a. Pains in head, abdomen, and legs; night-sweats and expectoration. Also slight cough and dyspnoea.

b. Prolonged expiration at right apex.

Diagnosis:-

Pulmonary Tuberculosis - incipient.

Treatment:-

General./

General. Cod-liver-oil and Syr. Ferri. Phosp. Co.

Tuberculin:- T.Bk. Commenced 22.7.1914. Series as follows:-

T.Bk.(5).1 cc,(4).02 cc,.03 cc,.05 cc,.07 cc,.1 cc, .1 cc,.15 cc,.3 cc,.5 cc,(3).08 cc,.1 cc,.2 cc, .2 cc,.4 cc. Weight increased from 34.5 K. to 36.8 K.

On 24.2.1915 commenced treatment with IK and T.Bk. combined:-

1.	2.
TBk(3).45 cc(injection)	(TBk (3).6 cc (injection)
IK(4).02 cc(inunction)	IK(4).06 cc (injection)
3.	4.
TBk(3).45 cc(injection)	TBk(3).6 cc (Injection)
IK(4).01 cc (inunction)	IK(4).06 cc (inunction)
5.	6.
TBk(2).08(injection)	TBk(2).1 cc (injection)
IK(3).01 cc (do.)	IK(3).04 cc (inunction)
7.	8.
TBk(2).15 cc(injection)	TBk(2).15 cc (injection)
IK(2).01 cc (inunction)	IK(2).01 cc (inunction)

9.
TBk(2).15 cc (injection)
IK(2).05 cc (inunction) IK(1).01 cc(relieving inunc).

(9 doses of IK with TBk. and 1 dose IK-TBk.)

Result of treatment:-

1. Reactions	None.
2. General condition	Same.
3. Weight	36.8 K. to 36 K. Loss .8 K.
4. Temperature	Same.
5. Physical signs	Same.

IK had no definite effect.

XVII. SUMMARY OF CLINICAL EFFECTS AND RESULTS OF IK TREATMENT IN THESE CASES AND CONCLUSIONS DEDUCED THEREFROM.

Number of cases treated with IK:- 41.
Total number of doses of IK given including both inunctions and injections:- 539.
No. of inunctions:- 206
No. of injections:- 333.
No. of local reactions with inunctions:- 2 doubtful.
No. of local reactions with injections:- 30.

Out of the 333 injections of IK there were only 30 local reactions in the arm at the site of injection. The local reaction usually resembled the local reaction of Tuberculin, consisting of redness, swelling, and tenderness. Frequently the local reaction developed on the night of the injection, lasting 1 day to 3 weeks.

On 7 occasions the local reaction was accompanied by a febrile reaction. On 6 occasions it was accompanied by general reaction and on 4 occasions by a focal reaction.

On 6 occasions the local reactions were accompanied by both a febrile and general reaction.

On only one occasion were the whole 3 reactions present - local, general and febrile.

The/

The local reaction never required any active treatment.

The local reactions were found more frequent as the result of injections than as the result of inunctions as was to be expected.

Febrile reactions with inunctions:-

Definite:- 8. Doubtful:- 8.

Febrile reactions with injections:-

Definite:- 5. Doubtful:- 9.

Total 30 febrile reactions in 539 doses of IK.
16 after inunctions of which half were dubious if due to the IK.
14 after injections of which 9 were doubtful if due to the IK. In some of the above febrile reactions marked definite the degree of definiteness is only relative.

In no case with IK was it possible to be so definite about the rise of temperature being due to the IK as for example it is in the case of Tuberculin.

In only 6 cases were the febrile reactions associated with a local reaction.

The febrile reaction was accompanied by a general reaction on 15 occasions, twice the general reaction was doubtful in these.

The febrile reaction was associated with a focal reaction on 14 occasions, one of these was a doubtful focal reaction.

Focal/

Focal reaction:-

There were only 16 focal reactions which might be said to be definitely due to the IK. If the physical signs increased or the chest symptoms increased definitely after an injection it was regarded as a definite focal reaction.

On 14 occasions of focal reaction there was also a febrile reaction and on 4 occasions a local reaction.

One could only judge rather uncertainly as to focal reactions because as a rule the patient did not attend till one week after the previous dose when focal signs might have passed off.

In regard to focal diagnostic reactions in cases of surgical Tuberculosis the results were negative. Spengler considered that such reactions were of value in the diagnosis of so-called Surgical Tuberculosis where the reaction in the diseased tissue could be examined by the naked eye.

Cases 10 and 11 were affected with Tuberculosis of the cervical glands but no focal reactions were evident under IK.

Case 32 suffered from Tuberculosis of the larynx but no reaction was evident in the larynx on examination with the laryngoscope.

Case 38 had doubtful reaction in the glands of the neck.

Case 39 showed no reaction in the intestines.

In case 14 there was a doubtful reaction angina.

General reactions:-

These followed more or less definitely the dose on 14 occasions.

In 20 out of the 41 cases there were no reactions of any kind and of these 20 cases 6 were on the injection method and 14 on the inunction method.

As would be naturally expected reactions are less liable to occur in the inunction method therefore.

Taking all forms of reactions as separate there were 94 reactions to 539 doses, i.e., 34 local, 30 febrile, 16 focal, and 14 general reactions.

From the small number of focal reactions one would judge IK was not a specific remedy.

Effect on physical signs:-

In 8 cases the physical signs improved during IK treatment but not in any case definitely as the result of the IK.

In 29 cases the physical signs remained unaltered.

In 4 cases the physical signs got worse.

Effect on general condition:-

Under IK 12 cases improved in general condition.

19 cases remained in statu quo.

10 cases got worse.

In no case could the improvement be shown to be the result of IK only. There is less doubt that cases/

cases 21, 23, 28 and 36 possibly got worse as the result of IK.

IK.

Effect on the weight:-

10 cases gained under IK, 27 lost weight, 4 remained the same.

Effect on temperature:-

In only 2 cases does the temperature chart show a defervescence as the result of IK. - cases, A.E. Maggs and N. Saunders.

In one case the temperature got much worse as the result of IK(1).2 cc injection. It remained high after this dose on January 22nd till March 10th. During this time it was at one time extreme hyperpyrexia. It rose again very high on April 12th, but the IK had then been discontinued.

Case 35 - the temperature got worse but not directly due to IK but due to the advancing nature of her disease.

Case 37 was similar.

Case 34 - (Mildred Woodley):-

Temperature remained persistently above normal for 13 months. She had 16 injections of H.B.E., reaching H.B.E. .00008 cc and then 19 injections of IK. but no defervescence occurred although IK original was given more than once.

Case 39 had persistent very high temperature due to/

to Tuberculous intestine but IK. had no defervescent effect.

From these 41 cases the general impression which I received was that IK was not a specific remedy in Pulmonary Tuberculosis and is of no therapeutic value. This deduction was made for the following reasons:-

1. From general results.

In 36 cases out of the 41 IK had no appreciable effect on the disease. In one case the effect was to make the case worse. Only 2 cases improved.

2. From effect on detailed results.

a. Effect on physical signs.

In only a minority was there improvement and in the majority the physical signs remained the same.

b. From effect on general condition.

In no case could any improvement be shown to be due to the direct effect of IK.

c. Effect on weight.

The majority lost in weight.

d. Effect on temperature.

Only one case showed defervescence.

e. Effect re reactions.

There were only 94 reactions in 539 doses.

XVIII. SUMMARY OF CASES TREATED BY IK BY OTHER OBSERVERS:-

A. Those (12) with very good results:-

1. Benoit obtained very good results in cases of osseous Tuberculosis and T.B. glands.

a. Method of dosage:- Started with .25 cc of IK (4). Continued thus:- .5, .75, 1 cc IK.(4) .25, .5,.75, 1 cc IK. (3), .25, .5,.75, 1 cc IK.(2). Interval of dose - 2 or 3 times a week. Ultimate dose rarely went above dilution (2). Thus he confirmed Spengler's observation that it is often quite unnecessary to go beyond the lowest dilutions.

b. Weight increased rapidly and considerably, often 5 - 6 Kg.

c. General condition usually much improved.

d. Physical signs always improved. Sinuses healed up and pus absorbed.

e. No local reactions. Some febrile. Number of cases treated not given. Type of case Bone and gland T.B.

f. General impression:- IK has specific effect and great therapeutic value.

Article "L'emploi des corps immunisants de C. Spengler dans le traitement des Tuberculoses locales, osseuses et ganglionnaires." Journal des Praticiens.. 1912.)

2./

2. Wallerstein obtained good results in Pulmonary Tuberculosis.

a. Method of dosage:- First used it in gradual method. Started with IK (6) or IK (7).
Interval of dose every 2 or 3 days. Increase of dose .1 cc to .3 cc.

He altered his method of dosage after a personal visit to Spengler at Davos.
Method of dosage:- Started with IK (7) - increased by .2 cc or .5 cc, often used rapid method increasing 10-fold or 100-fold till original IK reached, when increased gradually - .1.2.5.8-1 cc.
Interval of dose:- Smaller dilution every 6-5 or 4 days - original IK dose increased every week.

He lays special stress on a pause of 8-10 days after the first injection as recommended by Spengler. Also found that relieving injections arrested reactions.

b. Weight:- Found that in most cases weight increased.

c. General condition:- Found that in most cases this improved rapidly.

d. Physical signs and symptoms:- Fall of temperature, freer breathing, less sputum - T.B. bacilli fewer, rapid improvement of physical signs and creps cleared up.

e. Reactions:- Obtained lytic reactions after first/

first injection, rise of temperature 5-6 days after first dose. Severe lytic reactions usually after 5th or 6th injection. No local reactions.
Number of cases treated not given. Type of case - Pulmonary Tuberculosis stage 2 and 3.

f. General impression of IK. It is a valuable therapeutic remedy. He regards it as specific and polyvalent. Wallerstein (Berlin Klin. Woch 1910)

3. Dr Eversole and Lowman got marvellous results in cases of surgical Tuberculosis combined with disease in the lungs.

a. Method of dosage:- Started with .2 cc or .4 cc of 10 millionth or 100 millionth dilution of IK. - used rapid method. Increased each dose 10-10000 times stronger.

Interval - Injection every 3 or 7 days.
Ultimate dose - usually reached the original IK.

b. Weight:- In 19 cases described in detail of osseous and joint Tuberculosis all increased in weight.

One case of T.B. R apex, hip and knee, with 9 months treatment and 31 injections, weight increased 49 lbs.

c. General condition improved in all the cases described in detail. Good effect on the temperature and the pulse.

d. Physical signs and symptoms. In the 19 cases described/

described the physical signs improved. The discharge from abscesses and sinuses diminished.

e. Seemed to get very few reactions of any kind. He treated 218 cases of Pulmonary Tuberculosis.

f. General impression:- IK has a remarkable therapeutic value in treatment of T.B. bones and joints. It is doubtful how much of the success in these cases of bone and joint T.B. described by Eversole and Lowman was due to the ordinary methods of treatment e.g. demobilisation by plaster casts, etc., and how much of it was caused by the IK. (Eversole and Lowman, American Journal of Orthopoedic Surgery).

4. Dresdner found very good results in 3 cases of advanced Pulmonary Tuberculosis.

a. Method of dosage:- Started with .5 cc of IK (1 in 300,000). Increased dose on following scale:-

IK (1-300,000)	.5 cc - 1 cc - 2 cc.
IK (1-100,000)	1 cc - 1.5 cc - 2 cc.
IK (1-10,000)	.5 cc - 1 cc - 2 cc.
IK (1-1000)	.5 cc - 1 cc - 2 cc.
IK (1-100)	.5 cc - 1 cc - 2 cc.
IK (1-10)	.5 cc - 1 cc - Last dose repeated.

Interval of dose:- Injection every 2nd day.

Ultimate dose varied.

b. Weight not mentioned.

c. General condition improved in striking fashion.

In/

In the first case mentioned after 38 days the patient changes from a picture of advanced disease to one of health as result of 19 injections.

d. Physical signs and symptoms:- The number of T.B. in sputum decreased rapidly; physical signs in chest and larynx got much better. Improvement in the third case without using dilution higher than (4).

e. Reactions. Febrile reaction once after 1½ cc of IK (1-10000) - no reaction angina nor reaction diarrhoea.

f. General impression:- IK has a distinct beneficial influence on T.B. (Dresdner. Uber Behandlung mit Spengler's IK. Münch,. Med. Woch no.52 1909.)

5. Mitulescu obtained good results.

a. Method of dose:- Not given - used IK also with T.Bk. Von Ruck's Tuberculin and Filtrase.

b. Weight:- Not mentioned.

c. General condition:- This improved in his cases.

d. Physical Signs and symptoms:- Cough, night-sweats and temperature improved. Subjective symptoms better - good effect on scrofulous glands.

No. of cases 109 - 80 early.

e. Reactions:- Occasional slight febrile reactions.

f. General impression:- IK is specific, harmless and deserves further use.

(Mitulescu/

(Mitulescu Specifische substanzen in der Diagnose und Behandlung der Tuberkulose. Berlin Klin. Woch no. 33. 16.8.1909.)

6. Herzberg got apparently amazing results with IK.

a. Method of dosage:- Not described.

b. Weight:- Increased.

c. General Condition:- Marvellous improvement.

d. Physical signs and symptoms:- Marked bettering. Sputum and night sweats less - bacilli disappeared - One case of miliary T.B. (T.B. plus) cured in four weeks.

e. Reactions:- Not mentioned.

f. General impression:- IK specific, cures advanced Pulmonary Tuberculosis, cures slight and medium cases always.

These opinions of Herzberg are made too rashly.

7. Griffiths found IK very useful.

a. He gave IK along with P.T. Found IK diminished the tendency to reactions in the use of P.T.O. and P.T. In desperate cases it prolongs life.

He used it in advanced Larynx case along with P.T. with splendid results.

b. Weight:- Increased.

c. General condition:- Not mentioned.

d. Physical signs and symptoms:-

e./

e. Reactions:- It produced few reactions.

f. General impression:- Useful.

(Studies in Pulmonary Tuberculosis by F.G.Griffiths)

8. Lukin got good results with IK.

a. Method of dosage:- (This has already been described). Started with IK (7) - increases the dose 10-fold each time until IK original is reached. Like Wallerstein waits 8 - 12 days after first injection. Sometimes increases 100 or 1000-fold each dose.

In bad cases gives .2 cc or .5 cc of each dilution, in mild cases .2 - .5 cc of each dilution. In using IK original, uses the following scales:-

.1 - .2 - .4 - .7 - 1 cc or

.1 - .2 - .2 - .4 - .4 - .7 - 1 cc.

Lukin believes in the great value of relieving injections as also does Wallerstein.

Interval of dose every 8 or 10 days.

Ultimate dose 1 cc IK original.

General condition:- Improvement.

Physical signs:- Often found T.B. did not disappear from the sputum, sputum did not diminish nor physical signs clear up till after 3 months treatment and larger doses attained.

Reactions:- Frequent.

Number of cases 400, often in bad unhealthy surroundings.Lukin himself was cured by IK after being made/

made worse by previous Sanatorium and Tuberculin treatment.

General Impressions:- IK had very good effect on cases.

(Lukin Beiträge zur Klin. der Tuberkulose. Bd. 18 Heft 3.)

9. Awtokratoff.

Method of dosage already described.

Treated 800 cases in Siberia.

General Impression:- IK very useful.

(Wratschebnaja Gazeta nos.49 and 50, 1909).

10. Bock-Laibock[37] :- Good results in eye cases.

Method of dosage:- Inunctions of IK by patients into skin over elbow.

Improvement in physical signs. Disappearance of photophobia, of ciliary injection, of muco-purulent secretion, cornea cleared, K.P. disappeared, vitreous opacities cleared up, optic neuritis improved.

Reactions:- Local reaction sometimes; disappearing with relieving inunction.

Number of cases 53 - IK useless in only 9 of these.

General impression:- IK inunctions very useful in Tuberculous eye cases.

(Bock-Laibock Zeitschrift für Tuberkulose Bd. 22 Heft I. 1914.)

11./

11. Aguilar Jordan[38]:- Method of dosage not given.

Weight:- Majority of cases, given in detail, increased in weight.

Physical signs improved. Case of Ascitic T.B. peritonitis, abdomen diminished in size under IK very rapidly.

Reactions not mentioned.

Number of cases:- 16. Type of case was very varied - T.B. of peritoneum, intestines, lungs, tracheo-bronchial glands, adenitis, pleuro-pneumonia.

General impression:- IK very useful agent in treatment.

(Aguilar Jordan. Tuberculosis infantil y sur tratamiento por los cuerpos immunizantes de C. Spengler. Policlinica. Enero 1913. Num. 1.).

12. Godfrey[39] got excellent results in 8 cases but no details given.

(Lancet. 16.9.1911.)

B. Group of 16 authors who got good results:-

1. Selter[40].

He obtained good results in gland and joint Tuberculosis in children, in both subjective symptoms and physical signs. Details of treatment not given.

(Deutsch Med. Woch. No. 20. 1909.).

2./

2. Bergeron[41] used IK in only a few cases but obtained encouraging results.

(Les corps immunisants de Carl Spengler - La presse Médicale 21.4.1909.).

3. Gernsheim[42] confirmed Spengler's results with IK in 8 cases.

(Deutsch Med. Woch No.20. 1909.)

4. Dr John L. Porter used IK in joint Tuberculosis.

Method of dose:- Started with small dose of high dilution before rapid method.

Interval between doses 7 - 8 days.

Injections made into post. external surface of the flexed arm.

He insists on not too rapid dosage as hurry will do harm.

He advocates the use of Tincture Digitalis or Strophanthus during the whole course of treatment.

Number of cases and details not given.

General impression:- IK has curative effect and good influence on the general condition.

(Journal of the American Medical Association. 17.6.1911).

5. Pumr.[43]

Used IK in 52 cases. Most of these cases were of class Turban 2, some 1 and 3 - 15 were discharged cured - 18 cases were improved - 2 cases were not improved,/

improved, 3 died.

(Münch Med. Woch. 1910). Original article in Beiträg. zur Klin. der Tub. Bd. 16 Heft 4.)

6. Westphal.[44]

Injections made every 1 - 8 days. In adults started with .1 cc of (1), (2) or(3). In children started with .1 cc (4).

Increase in dose .1 or .2 cc.

General impression:- Good effect on temperature, and quite acute cases improved. Cure in 2 joint cases and 1 peritonitis.

(Münch Med. Woch. 1910). Original article in Beiträg. zur Klin. der Tub. Bd. 16 Heft 4.

7. Hollos lays special stress on the relief of Tuberculous toxaemia by the use of IK.

Method of dosage:- Used inunction method. Started in one case with inunction of 5 drops of IK (1 in 30,000) rubbed in daily. This caused severe febrile, focal and general reaction. This is what we would expect as repetition of small doses causes lysis according to Spengler. This is a wrong method of use but the T.B. in the sputum fell from Gaffky 10 to Gaffky 6 notwithstanding.

Inunctions were then given every 2nd or 3rd day till IK (1 in 10,000) was reached. The patient then repeated the dose daily till again lytic reaction produced./

produced. Again the T.B. bacilli diminished as a result to Gaffky 3 or 4. Ultimately sputum became T.B. free.

Hollos advised the following method of dosage:-
Start with (1 in 100,000 - 1,000,000 IK).
Increase dose .1 - .2 cc every 4 - 6 days. Continue treatment 8 months, cease 2 - 3 months and then resume till case cured. This resembles Petruschky's Etappen method in Tuberculin therapy.
Weight increased.
General condition:-

He found IK caused relief from most of the subjective symptoms of Tuberculous toxaemia. These symptoms are very varied and indefinite:-

a. Headache, vertigo.
b. Insomnia - sleepiness.
c. Vasomotor disturbances.
d. Sweating.
e. Fatigue.
f. Nervousness, laziness.
g. Pain in stomach - anorexia, emesis.
h. Constipation.
i. Menstrual disturbance.
j. Graves' disease.

He found constipation of obstinate type disappear after one injection of IK. or inunctions of IK, also improvement in menstruation. He found marked improvement/

improvement in Graves' disease with IK so that he considers this is due to T.B. Bacilli in sputum lessened.

Reactions:- He got marked lytic reactions, febrile and general reactions. He found relieving injections very useful.

General impression:- IK has a specific effect.

(Die Tuberkulosen Intoxicationen Zeitschrift für Exper-Pathol. und Therapie. Vol.8. 1911.)

8. Wolff.

Method of dose:- Started with dilution (5) or (6). Increases the dose up to saturation till he obtains a local reaction lasting over 5 days.

The subfebrile forms with temperature over 37°C. and with greater range of temperature than 1° C. or inverse temperature require care, smaller doses with longer intervals.

He also recommends pause of 3 to 6 months and then repetition of the course.

General impression:- IK useful in ambulant treatment of early cases, good results in children and young adults.

Like Fearis he recommends the use of IK in municipal Tuberculosis stations.

(Münch Med. Woch. No.15. 1909).

9. Breuer.

Method of dosage:- Started with .1 cc IK (5) - Increased/

Increased at each injection .2 or .3 cc. - Interval between doses 2 - 3 days. - Ultimate dose:- In 16 cases he repeated the dose 1 cc IK original at 8 day intervals.

Number of cases:- 34 cases treated. He divided these into 5 classes:-

a. T.B. of lungs only.

b. T.B. of lungs and larynx.

c. T.B. of lungs, intestine and peritoneum.

d. T.B. of lungs and pleura.

e. T.B. of lungs and glands.

a. Group. He treated 16 cases of the first group, 5 showed improvement.

Weight:- In these 5 cases weight increased on the average 11 lbs.

2 cases lost T.B. in sputum.

2 cases sputum disappeared.

In only 1 case did the temperature become normal and the pulse also normal.

Physical signs unaltered mainly. Haemoptysis arrested in one case.

8 cases showed no good effect. In 2 cases IK was given up because of haemoptysis.

Weight increased in 5 of these 8 cases.

Physical signs and subjective symptoms unaltered usually.

3 cases got worse, no increase in weight. Temperature,/

Temperature, pulse, T.B. in sputum worse. Physical signs worse.

b. Group:- 3 good result, one no effect, one worse.

Weight:- 2 increased, 2 lost, 1 same.

Physical signs, lungs - unchanged in 3 cases, 1 improved, 1 worse.

Physical signs, larynx:- improved in 3 cases, 1 no change, one worse.

c. Group:- All got worse.

d. Group:- 1 good result, 1 improved, 1 in statu quo.

e. Group. 2 showed improvement in glands.

Reactions:- Severe febrile and local reactions.

General impression:- Results with IK were no better than the results attained in ordinary Sanatorium treatment and the good results were due to this and not due to the IK. He was unconvinced of any specific effect.

(Breuer. Klinische erfahrungen mit der IK Behandlung nach C. Spengler.)

10. Brauns.

Brauns recommends injections of IK along with Artificial Pneumothorax treatment. He neutralises the tuberculous toxins before and after the operation with IK injections. He describes a case of bilateral phthisis/

phthisis and tuberculous laryngitis thus treated with marked success.

(Zur behandlung der Lungenschwindsucht mittels Künstlichen Pneumothorax. Zietschrift für Tuberkulose. 1910).

11. Willers[45] reports satisfactory results in 40 cases.

12. Kirschenblatt.

Method of dosage.

He believed in the great efficacy of relieving injections. Reached the original IK.

Physical signs:-

He found IK produced degenerative changes in the T.B. bacilli, numerous splitter and degenerative forms. Good effect on the temperature, sometimes even in rapid acute cases defervescence in 1 or 2 months. IK has anticatarrhal effect.

Reactions:-

Frequent focal and febrile reactions. Local reactions were rare.

Cases:-

Good results in stages 1 and 2 and sometimes even in cases of stage 3. His cases were not treated in Sanatorium but often in very bad surroundings in Tiflis.

General impression:-

a./

a. IK has a right specific effect.

b. IK has a bacteriolytic effect.

c. IK has an anticatarrhal effect.

d. IK has an antifebrile effect even in severe cases.

(Bemerkungen zum Artikel G. Simons - Zeitschrift für Tuberkulose. 1910).

13. Simon and Gumprecht.

Method of dosage:-

Subcutaneous injections. Started with .1 or .2 cc IK (5) or IK (4). Increase of dose .1 - .2 cc.

Number of cases:- 42.

8 - Turban 1.

14 - Turban 2.

20 - Turban 3.

In 8 cases first stage all gave good results:-

Weight:- Increased.

General condition:- All improved.

Physical signs:- Improved in 2 cases. Sputum disappeared in one case.

In 14 cases of stage 2:-

Weight:- Only one lost weight. The 7 others gained in weight, average gain 4.2 Kg.

Physical signs:-

8 had catarrhal symptoms - 4 got rid of them, 3 less, 1 worse.

3/

3 had T.B. plus - 2 lost the bacilli.
All were discharged fit for work.

In 20 cases of stage 3:-
Weight:- Average gain 3.6 Kg.
Physical signs:-

14 had T.B. plus - None lost their T.B. - 2 fewer, 6 same, 6 T.B. increased.

7 lost their catarrhal symptoms.

No patient in this group cured.
Reactions:-

In two cases IK caused such unpleasant general reactions that it had to be given up.

Local reaction in the shape of redness frequent, but never as much as with Tuberculin. Local swelling rare.

Febrile reaction rare. Reaction angina never occurred. IK has no immunising effect against OT.
General impression:-

IK has definite specific effect. It may have some effect in slight and medium cases, but none in severe cases. Effect in no way brilliant.

(Simon - Zeitschrift für Tuberkulose. Vol. 15. 1910).

46

14. Castaigne and Gouraud.

Found that IK was useful in early cases. They observed lessening of the fever, diminution in the pulse rate, improved general condition, increase in weight/

weight and appetite, diminution in sputum, improvement in the physical signs, diminution in the number of bacilli. Also got good results in Tuberculosis of the kidneys.

(Journal Médical Francais No.10. 1910).

15. Fearis.

Recommends IK for dispensary work. He claims as its advantage for this:-

a. Simple in use.

b. No contra-indications.

c. Proved useful in adverse conditions.

d. Treatment while patient is at work.

(British Journal of Tuberculosis Vol.7).

16. Woolston.

Obtained marvellous results in cases of acute miliary Tuberculosis.

He saw marked improvement in the general condition, better appetite, less sputum, fewer bacilli, gain in weight, better pulse and temperature. He found it took longer to improve the pulse and that sometimes cardiac stimulants were required.

He did not consider IK harmless as in 2 cases it seemed to cause a reactivity of obsolete foci.

(Medical Record. New York. 8.10.1910.)

C./

C. Those 11 authors who obtained indifferent effects:-

1. Weintraud[47].

He saw no good results in his cases.

2. Meissen.[48]

He never observed any direct injury as the result of IK nor did he see any good results.

(Zeitschrift für Ärztliche Fortbildung. May 1910).

3. Koch criticises Herzberg's rash conclusions. One cannot decide that a case of Pulmonary Tuberculosis is healed in 3½ months as Herzberg did.

4. Roth was doubtful as to the value of IK.

Method of dosage:-

Started with .1 cc IK (5). Increased .1 cc or .2 cc or .3 cc. Injections 3 times a week.

Highest dose .5 cc IK original.

Number of cases:- 26 severe cases.

14 cases treated with high dilutions of IK. In a few cases there was a gradual fall of temperature to normal. Bacilli did not disappear.

12 other cases no disappearance of bacilli. No improvement in Physical signs.

2 early cases showed rapid improvement but bacilli remained.

Reactions occurred in most cases but never papule formation nor widespread inflammation.

Occasionally/

Occasionally febrile reactions to 39° C. - No reaction angina, no reaction diarrhoea.

General impression:- No effect on severe cases of Pulmonary Tuberculosis. Its influence on medium and early cases is doubtful. It may have slight specific effect but no healing properties.

(Roth. Mitteilung uber die Behandlung der Lungentuberkulose mit IK. - Münch. Med. Woch. Nov.6. 1910)

5. Schaefer found the results with IK of neither positive nor negative value.

Method of dosage:- Subcutaneous injections.

Given twice a week, increase at first $\frac{1}{100}$ mg. then $\frac{1}{10}$ mg. each dose.

Gradual method followed by more rapid method.

Number of cases:- 16 treated. The cases were not slight but the prognosis was not bad. In only 2 cases did T.B. disappear.

Reactions:- In one case the temperature rose and never fell so that patient's general condition got worse.

No needle-track reaction, no reaction angina, nor reaction diarrhoea. No focal reactions so IK. of no value in diagnosis.

General impression:-

IK has no effect in Pulmonary Tuberculosis either in a positive or negative sense.

(Uber/

(Uber behandlung mit Carl Spengler's IK. Münch. Med. Woch. Nov. 16th. 1909).

6. Kerlé obtained no striking benefit from the use of IK.

Method of dosage:-

Started .1 cc IK (5) - Increase .1 cc. - Interval of dose with IK (5) and (4) injections made 3 times a week; with the higher dilutions given twice a week.

Number of cases treated:- 35.

a. Group. Both cases showed no improvement. Temperature made worse. Physical signs in lungs and larynx worse. Not due to the IK.

b. Group. All very ill. General condition and weight improved. Physical signs not improved. T.B. remained positive - no effect on pyrexia.

c. Group. Physical signs not so extensive, prognosis good.

Some improvement in physical signs and general condition. T.B. and pyrexia remained.

Weight and general condition usually some improvement.

Physical signs and T.B. unaffected.

Reactions:- No typical, local or general reaction.

General impressions:-

11 severe cases with bad prognosis unimproved.

22 medium and severe cases results no better than without IK.

2/

2 early cases much improved.

IK. of no value in severe cases; no definite effect in early or medium cases.

Kerlé considers that the discrepant results in the use of IK by various authors may be due to the use of the various IK.s. issued by Spengler.

(Beitrag. zur Behandlung mit IK. Berlin Klin. Woch. 1910).

7. Roepke considered IK of no use.

Method of dosage:-

Started with IK (1 in 100), doses at first every second day. The number of the doses varied in the cases and the number of injections varied from 6 to 62. Used various IK.s. Gradual then rapid increase.

Weight and general condition:-

Some cases improved greatly in this respect but Roepke considered that this was the result of the Davos climate.

Number of cases:- 67.- 19 in Stage 2 - 48 in Stage 3.

Physical signs: amount of sputum:-

In statu quo in 8 cases at end of treatment, less in 29, increased in 30.

Bacilli in Gaffky's scale:- 6 cases had no T.B. throughout. Only one case lost bacilli. One case developed T.B. in sputum.

Of the other 59 cases 20 in statu quo, 21 less,

18 increase.

This is contradictory to Spengler's assertion that often with IK the bacilli diminish in 8 - 14 days.

Physical signs:- 4 worse - 38 in statu quo - 24 improved.

No effect on T.B. complications.

Reactions:- No focal reactions. Sometimes redness and swelling locally after repeated injections. IK no use for diagnosis. No febrile reactions, no defervescence.

General impression:-

IK is worthless and as useful as normal saline injections.

(Ergebnisse der Tuberkulose - Immunblut IK Behandlung. Deutsch. Med. Woch. No.42, page 1831. 21st Oct. 1909.)

8. Weicker and Bandelier[49].

Method of dosage:-

Same as used by C. Spengler. Also used IK 100 times as strong as original IK, but obtained no lytic effects.

Number of cases:- 200 of Turban 2 and 3.

Also complications in larynx, glands, knees and intestines.

Weight and general condition improved sometimes, subjective symptoms improved but this was due to the Sanatorium treatment.

Physical signs:-

No lessening of sputum nor T.B. in sputum. No defervescence. Some slight defervescence in early cases but due to the Sanatorium treatment. No anti-toxic effect. Cases treated for 3 months with IK still react to alt. T. and the power to react to alt. T. not diminished after IK. treatment. No lytic effect on T.B. bacilli nor destructive effect on bacillary capsules.

Reactions:- No focal reaction, no gland, angina nor diarrhoea reaction.

General impression:- IK is of no value one way or the other.

(Uber IK. Deutsch. Med. Woch. P.1833. 21st Oct. 1909).

9 and 10:-

Lucius Spengler[50] and Peters saw no good effects and also no bad effect from IK.

11.

Another observer used IK in 200 cases of eye disease due to T.B. He got no very encouraging results. In 4 cases of relapsing T.B. swellings of the cornea and interstitial keratitis he saw some improvement.

(Zeitschrift für Tuberkulose Bd. 22. Ht.7. 1914).

D./

D. In the case of the other 3 authorities to which I have referred the results with IK were definitely bad.

I. Exner and Lenk[51] used IK in 6 cases of surgical T.B. treated for 6 months. In case of caries of the sacroiliac joint with fungating foot, fistulae, and bilateral disease at the apex, IK had to be given up because of the severe rises of temperature and the general condition becoming much worse.

A female with T.B. peritonitis, T.B. bowels and early T.B. of apex. IK used, and death took place in 2 months from miliary T.B.

One patient with Pulmonary Tuberculosis and T.B. of epididymis got worse.

The other 3 cases showed no change.

(Uber erfahrungen mit anwendung der Spengler-schen IK therapie bei chirurgischer Tuberkulose. Zentralblatt für Chirurgie. No.30. 1910).

2. Alexander.

He used IK in 11 cases of medium and advanced Pulmonary Tuberculosis. 6 got worse both subject-ively and objectively.

He observed no increase in appetite nor in weight, and no diminution in the number of bacilli.

Unpleasant subjective symptoms were frequent.

(Beiträge zür Klinik der Tuberkulose. Bd.XIV, Ht.2)

3./

3.

Baer[52] describes 10 cases in detail which he treated with IK. In all the cases the results were bad. One case of closed Tuberculosis became under IK a case of open Tuberculosis. Another case had a relapse from Syphilis after the use of IK. One case had as the result of IK treatment severe breaking down of the posterior wall of the larynx. Another case which did badly under IK was cured with Alt. Tuberculin.

Weight. All cases lost weight.

General condition. Appetite made worse, increase in cough and sputum.

Physical signs. These were made worse.

Number of cases treated 10, mostly of II and III stage.

General impression. IK caused severe subjective phenomena and only bad effects.

(Erfahrungen mit C. Spengler's IK. Berlin. Klin. Woch. 29 Jan. 1912).

4. Gantz treated 12 cases with bad results.

Method of dosage:- Gantz erred in his method. He repeated the same dose of IK (1) and got repeated febrile disturbance.

Weight:- 3 gained slightly.

General condition:- Worse.

Physical Signs:- No effect on number nor changes in/

in the bacilli. Physical signs made worse. No defervescent effect.

Number of cases:- 14.

2 I Turban, 7 II Turban, 5 III Turban, 3 died, 1 better, 1 worse.

General impression:-

IK had a bad effect. He considered IK was specific because in one case after .8 cc IK (1) he saw a relighting of a quiescent Moro's reaction.

(Uber die Immunkörper behandlung der Lungentuberkulose nach C. Spengler. - Wien. Klin. Woch. No. 28. 1910).

5. Kraftt[53].

18 cases - unfavourable results.

6. Pigger:-

Pigger had bad results in unfavourable cases.

7. Starkloff[54] deprecates the use of IK. Used in 6 cases, 5 showed exacerbation.

(Kohler's results of Tuberculosis Research 1911)

18. Udinzew.[55]

21 cases. Only one case improved - stage 1 case ? due to IK. 7 cases made worse.

General impression:-

IK useless.

(Zeitschrift für Tuberkulose. Bd.22. Heft 7. 1914.)

XIX. SUMMARY OF CLINICAL EFFECTS OF IK AND RESULTS OF IK TREATMENT IN THESE CASES AND CONCLUSIONS DEDUCED THEREFROM.

Results of other observers.

I have referred to the original articles of 47 other observers who have used IK in the treatment of Tuberculosis and will divide their results into:-

1. General results.
2. Detailed results.

1. General results:-

12 obtained very good results.

16 obtained good results.

11 obtained results which pointed to IK being indifferent in its effects.

8 obtained definitely bad results.

From these results therefore it is seen that the balance is in favour of IK because 28 against 19 out of 47 physicians who have used IK received the impression that IK produced good effects in the treatment of Tuberculosis.

Bandelier and Roepke in their book on the specific treatment of Tuberculosis state in reference to the results with IK that 31 authors had good results, 17 indifferent results and 3 bad results. In their resumée on their results with IK they mention a few authors/

authors whose articles it was impossible for me to refer to.

In the articles of the 47 different physicians which I had access to, 2200 cases are described in detail. In 1440 cases the results were good, in 217 the condition remained in statu quo, and 71 of the cases were made worse.

In the vast majority of the cases therefore which have been described in detail by these physicians, the results were favourable to the use of IK. We must remember however that in each one of us there is a tendency to describe our good cases and forget our bad results.

2. Detailed results:-

A comparison in these results in the 47 articles referred to was almost impossible because one physician mentions the results in one detail or works out his opinion from one series of details while another omits the details which received special attention from others.

a. Weight.

An increase in weight is mentioned by 14 out of the 47, 30 do not mention weight definitely, 3 authors remarked specially on loss of weight under IK.

b. General condition.

17 authors mention definite improvement. Hollós especially lays stress on IK allaying the subjective symptoms/

symptoms due to Tuberculous toxaemia. 24 do not specially mention the effect of IK on general condition. 5 mention definite deterioration in general condition as the direct effect of the use of IK.

c. Physical signs.

16 obtained improvement in the physical signs. 6 found the physical signs made worse. 20 do not mention their results in this respect in detail. 2 found that the physical signs remained unaffected. Kerlé and Roepke saw both improvement and aggravation of the physical signs.

d. Temperature.

6 make special mention of defervescence due to IK.

e. Sputum.

7 pay special attention to decrease in the number of Tubercle Bacilli in the sputum.

f. Reactions.

10 authors mention febrile reactions.

5 authors mention local reactions.

3 authors mention general reactions.

2 authors mention focal reactions.

Discrepancy of the results of different observers:-

Some obtained brilliant results, others indifferent results, and others had bad results. Krafft, Baer, Gantz, and Udinzew condemn IK as a dangerous remedy. Schaefer, Bandelier, and Meissen found IK had/

had no deleterious effect and also no beneficial effect. They considered it as quite indifferent. From my own experience I am inclined to the same conclusion. Dresdner, Wallerstein, Herzberg, Lukin, Eversole and Lowman, and Awtokratoff got excellent results with IK.

It is difficult to say why these results should be so varied.

1. It may be due to the pleomorphic nature of the disease of Pulmonary Tuberculosis which renders it always difficult to say whether improvement or the opposite is definitely the result of any specific method of therapy or due to the natural processes of the disease.

2. It may be due to differences in the IK preparations used. Spengler asserts that he has made 8 or more different IK preparations varying in lytic and antitoxic titre.

3. It may be due to different methods of dosage. Everyone knows the great variety of results obtained in the use of Tuberculin due to these same causes. Bad results were produced in the first Tuberculin era due to faulty methods of dosage. It is quite probable that some of the bad results of IK were due to wrong methods. Gantz[56] in his article (Wien. Klin. Woch. No.28, 1910) has evidently not used IK according/

according to the originator's instructions. He used repeated doses of the same dose and gives a chart showing repeated febrile reactions after repetition of the same dose IK (1). This case became worse. Repetition of the same dose is specially warned against by Spengler as the cause of bad effects and hyper-sensitiveness to IK. Case 21 of my own series may be a case in point. This patient received several such injections during my absence.

Roepke gave the injections every alternate day which is too frequent.

Robin[57] advises the repetition of the same dose in his article on IK in the Journal des Praticiens, 1912, p. 169.

Kraft and Alexander also seemed to have erred in their method of administration.

From these observations therefore one must agree that the general impression is in favour of the use of IK and that the majority of specialists who have used IK judge from general results in its favour.

There is still the question of the specific nature of IK. to decide.

1. The numerous and laborious laboratory tests of Spengler in regard to its immunising properties are the strongest arguments in favour of the specific nature of IK (see chapter IV).

2./

2. Also the brilliant clinical results obtained by its use in some cases lends to the conviction that IK is a specific remedy for Tuberculosis. Benoit, Wallerstein, Mitulescu, Herzberg, Hollós, Kirschenblatt, and Roth came to the conclusion that IK was a specific remedy for that reason.

Gantz regarded IK as specific to T.B. because he noticed a reaction in a quiescent Moro's test as the result of an injection of IK.

3. Precipitation tests point to the specificity of IK.

Against the specific value of IK you have the fact that focal reactions are very few in its use - only 2 out of the 47 authors referred to mention focal reactions. From my own series of cases, owing to the few focal reactions obtained, I am inclined to the same opinion. In 539 doses I only had a focal reaction on 16 occasions. The focal reaction is one of the strongest arguments in favour of the specific nature of Tuberculin. Another fact which points to IK being non-specific was the phenomenon observed by Wallerstein. He saw a febrile and general reaction after .2 cc IK (7) in 2 apparently healthy persons. These persons had however an inherited tendency to the disease. Extensive trials of IK on healthy persons to prove this point have not been performed.

According/

According to Bandelier and Roepke IK has no antitoxic effect against Alt-Tuberculin. They found that persons who had received repeated injections of IK still reacted to Alt-Tuberculin. In some of my own series of cases I found that Von Pirquet was still obtained plus, although IK had been given.

IK reactions and anaphylaxis:-

Spengler asserts that the acid nature of IK prevents anaphylactic phenomena. Certainly IK contains foreign animal albumin. In case 28 of my series reactions occurred resembling anaphylaxis.

XX. GENERAL SUMMARY.

From a survey of the whole question therefore the conclusion is that IK is of value in the treatment of Pulmonary Tuberculosis as the majority who have as yet used it speak in its favour, but there are some who have used it extensively and found it indifferent in its effects and from my own results I must place myself amongst those who regard it as of little value as a specific remedy.

In regard to the specific nature of IK I must conclude that the question is still not completely settled.

BIBLIOGRAPHY.

---

1. Riviere and Morland. Tuberculin Treatment. Page 6

2. W. Camac Wilkinson. Parkes Weber Prize Essay on the Use of Tuberculin Page 6

3. Bandelier and Roepke. Lehrbuch der Spezifischen Diagnostik und Therapie der Tuberkulose. Page 6

4. Kirchenstein. Uber die Leistungsfähigkeit der Pikrinmethode C. Spenglers fur die Färbung der Tuberkelbazillen. Uber die Pikrinmethode C. Spenglers. (Zeitschrift für Tuberkulose). Page 12

5. Fearis. The treatment of Tuberculosis by Immune Substances (I.K.) Therapy. Page. 12, 95

6. R. Tanner Hewlett. Manual of Bacteriology. Page 13

7. Klemperer. Experimenteller Beitrag zur Tuberkulose Frage. (Zeitschrift für Klinische Medicin. 1905. Bd. 56. p.241.) Page 17

7a. Otabe. Kultur-und-Tierversuche mit Menschlichen und Rindertuberkelbazillen. (Thesis for M.D. Basle.). Page 18

8. Bonome. Präzipitin - Reaktion als diagnostisches Mittel der Tuberkulose (Zentralblatt für Bakter--iologischen Parasitenkunde und Infektionskrankheiten. Bd. XLIII. Heft 4.) Page 19

8a. Fearis. (British Journal of Tuberculosis. Vol. VIII) Page 44

9. Wallerstein. Uber IK. (Berliner Klin. Wochenschrift.) No 16, 1910. Page 48

10. Die Tuberkulose Intoxikationen. (Zeitschrift für Experiment. Pathologie und Therapie. Vol. VIII 1911.) Page 50

10a. Hollós. L'immunite Tuberculeuse et ses consequences prognostiques. (Gazette des Hôpitaux Juli 10. 1913)
Page 51

11. Awtokratoff.
(Zeitschrift für Tuberkulose. Original article Wratschebnaja Gazeta. No.49. - 50. 1909.)
Page 53

12. Lukin.
(Beiträge zur Klinik der Tuberkulose. Bd.XVIII, Ht. 3). Page 54

13. Kerlé. Beitrag zur Behandlung mit IK.
(Berliner Klin. Wochenschrift No.14. 1910.)
Page 57

14. Simon and Gumprecht. Erfahrungen mit der IK - Behandlung nach C. Spengler. (Zeitschrift für Tuberkulose. Bd. XV. Hft.1 1909.)
Page 57

15. Breuer. Klinische efahrungen mit IK nach C. Spengler. (Aus der Friedrich Wilhelm Stiftung zur Bonn Dissertation. 1911.)
Page 57

16. Eversole and Lowman. The use of Carl Spengler's IK Serum in treatment of Tuberculous Joint Disease with report of cases.
(American Journal of Orthopoedic Surgery. Nov. 1912) Page 57, 85

17. Roth. Mitteilung uber die Behandlung der Lungentuberkulose mit IK.
(Münch. Med. Woch. Nov. 6 1910.)
Page 57

18. Benoit. Sur l'emploi des corps immunisants de Spengler dans le traitement des tuberculeuses locales, osseuses et ganglionnaires.
(Journal des Praticiens. 1912. p.221.)
Page 57

19. Dresdner. Uber behandlung mit C. Spengler's IK.
(Münch. Med. Woch. No.58. 1909.)
Page 57

20. Wolff. Ambulante spezifische behandlung der Tuberkulose. (Münch. Med. Woch. No.15. 1909).
Page 57

21. Roepke. Ergebnisse der Tuberkulose - Immunblut - IK Behandlung.
(Deutsch. Med. Woch. No.42. 21. Oct. 1909. p. 1831.
Page 57

22. Schaefer. Uber behandlung mit Spengler's IK.
(Münch. Med. Woch. Nov.16.1909).
Page 58

23. Brauns. Zur Behandlung der Lungenschwindsucht mittels Künstlichen Pneumothorax.
(Zeitschrift für Tuberkulose. 1910.)
Page 59

24. Griffiths. Studies in Tuberculosis.
Page 60

25. Mitulescu. Spezifische Substanzen in der Diagnose und Behandlung der Tuberkulose.
(Berlin. Klin. Woch. No. 33. Aug.16. 1909.)
Page 61

26. John L. Porter.
(Journal of the American Medical Association. June 17. 1911.)
Page 61

27. Kirschenblatt. Bemerkungen zum Artikel C. Simon
(Zeitschrift für Tuberkulose. Vol.15. 1910.)
Page 63

28. Armstrong. IK Therapy.
Page 64, 72

29. Kirchenstein.
(Zeitschrift für Tuberkulose. Bd.19. Heft 6. 1913.)
Page 69

30. Herzberg. Vorlaufige mitteilung uber die Behandlung mit IK. (Dr Spengler.)
(Münch. Med. Woch. No.5. 1909.)
Page 73

31. Woolston.
(Medical Record. New York. Oct. 8. 1910.)
Page 73

32. Alexander.
(Beiträge zur Klinik der Tuberkulose. Bd.XIV. Ht. 2).
Page 73

33. Fearis. A modification of Spengler's Rapid Precipitation Method for the estimation of approximate immunity against Tuberculosis. (The Practitioner. April 1913.)
Page 79

34. Fuchs-Wolfring. Die diagnostische und prognostische bedeutung der Precipitines des Gesamtblutes bei Tuberkulose.
(Zeitschrift für Tuberkulose. Bd. XVIII. Ht. 6. 1912.)
Page 80

35. W. E. Cooke. The nuclear changes in Polymorphonuclear Neutrophile Leucocytes in Pulmonary Tuberculosis.
Page 90

36. Benöhr and Hoffmann. Anwendung und Wirkungsweise des IK an des Hand von Krankengeschеiten aus der Carl Spenglerschen Praxis.
(Beiträge zur Klinik der Tuberkulose. Bd.XVI. Ht. 4.)
Page 97

37. Bock Laibock. Uber behandlung skrofuloser und tuberkulöser Augenkrankheiten mit IK.
(Zeitschrift für Tuberkulose. Bd. 22. Ht. 1. 1914.)
Page 161

38. Aguilar Jordan. Tuberculosis infantil y sur tratamiento por los cuerpos immunizantes de C. Spengler.
(Policlinica. Enero 1913. Num. 1.
Page 162

39. Godfrey.
(Lancet. Sept. 16. 1911.)
Page 162

40. Selter. Erfahrungen uber den Spenglerschen Immunkörper bei der Tuberkulinbehandlung.
(Deutsch. Med. Woch. No.20. 1909.)
Page 162

41. Bergeron. Les corps immunisants de C. Spengler.
(La presse médicale. 21 Avril. 1909.)
Page. 163

42. Gernsheim.
(Deutsch. Med. Woch. No.20. 1909.)
Page 163

55. Udinzew. Klinische Beobachtungen bei Behandlung Tuberkuloser mit Tuberkulin Denys und IK Spengler.
(Russ. Tuberkuljes. 1912. Heft 4.)
(Zeitschrift für Tuberkulose Bd.XXII. Ht. 7. 1914.)
Page 181

56. Gantz. Uber die Immunkörper behandlung der Lungentuberkulose nach C. Spengler.
(Wien. Klin. Woch. No.28. 1910.)
Page 185

57. Albert Robin. Phthisiotherapie.
(Journal des Praticiens p. 169. 1912.).
Page 186

Carl Spengler's Tuberculose und Syphilis Arbeiten.

This work has been so frequently quoted that I have placed it by itself as requiring special mention. It contains Spengler's original articles.

Additional references to IK in medical literature.

1. Wein Therapeutischeskoje Obozrenie.No.2-4. 1912.

2. Wein Medizinsche Klinik. No.7. 1912.

3. Wein. Orvosi Hetilap. No.8. 1912.

4. Sezany. Tuberculinotherapie et Serotherapie. Baillier et fils. Paris.

5. Leschke. Internat. Zentralblatt fur die gesamte Tuberkulose forschung. No.11. 30.9.12.

6. Biro. Budapesti Orvosi Ujsag. No.3. 1913.

7. Sbisa. La Tuberculosi. Vol.5 fas.I - III. 1913.

8. Fuchs-Wolfring. Gesundheit. No.20. 21.1912.

9. Fuchs-Wolfring. Gesundheit. No.23. 1912.

10. Fuchs-Wolfring. Zur IK behandlung. Verlag Bergmann. Wiesbaden, 1911.

11. Hollós. Budapesti Orvosi Ujsag. No.18. 1909.

12. Galecki und Budzynski. Gazetta Lekarska. No.13-16. 1910.

13. Hollós. Symptomatologie und Therapie der latenten und larvierten Tuberkulose. Verlag Bergmann. Wiesbaden.

14. Kerpilowsky. Wratschebnaja Gaseta. No.46. 1910.

15. Winzeff. Zeitschrift Tuberkulose. Petrograd No.4 1912.

16. Perrin. La Province Médicale. No.24. 1913.

17. Daco. La Presse Médicale. No.19. 1913.

18. Renaux. Journal Medical de Bruxelles. No.50. 1909.

19. Motz. Revue Clinique d'Urologie. Juli. 1912.

20. Castaigne. Tuberculose renale. La Clinique, Paris. No.23. 1911.

21. Revue de la Tuberculose. T.IX. Février. 1912.

22. Lelongt. Traitement spezifique de la Tuberculose des Organes Genito-urinaires. These. Paris. 1911.

23. Minet et Leclerc. Echo medical du Nord. Fevrier 25. 1912.

24. Thieberge et Weissenbach. Bulletins et Memoires de la Société Med. des Hôpitaux de Paris. No.10. Mars. 23. 1911.

25. Weihrauch. Berlin. Klin. Woch.

26. Dr W. Jarvis Barlow. Southern California. Practitioner. No.11. 1910.

27. W. Warner Watkins. Southern California Practitioner. Aug. 1912.

28. Dr Oscar Benker. Interstate Medical Journal. Vol. XVII. No.12. 1910.

29. Dr C.W. Leigh. Illinois Medical Journal. Vol. XIX. No.4. 1911.

30. Dr Cardinal Quinn. Chicago Medical Recorder. No.2. 1912.

31. Dr Robinson. St. Louis Medical Review. No.11. 1912.

32. Dr Ryan. Journal of Iowa State Medical Society. Jan.15. 1912.

33. Dr Woolston. Lancet Clinic. Cincinnati. Vol. CV. No. 3. 1911.
